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THE USE OF ANTI-EMETIC DRUGS IN ANAESTHESIA

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From the point of view of the patient a distressingly common complication of anaesthesia, in particular of general anaesthesia, is nausea, retching and vomiting, and anaesthetists have long sought means of alleviating these unpleasant sequelae.

Advances in physiology and pharmacology have led to the postulation of the existence of emetic trigger zones and an emetic centre, either or both of which can be depressed by drugs and in particular by the group of phenothiazine derivatives. The anti-emetic properties of these drugs are bound up with other actions, some desirable and others less so. Thus, while the anaesthetist welcomes the drug which has a general tranquillizing effect in addition to an anti-emetic one, he may be embarrassed by an associated hypotensive action or by a prolongation of post-anaesthetic unconsciousness.

POST-ANAESTHETIC VOMITING

Some doubt has been thrown on the wisdom of trying to reduce the incidence of post-anaesthetic vomiting, particularly where these efforts may be associated with less desirable side-actions. Post-anaesthetic vomiting may be due to a number of factors, some of which, e.g. the vomiting due to bowel obstruction, are of diagnostic importance to the surgeon. In these patients drug-induced suppression of vomiting may prove a hazard in the post-operative period. There are, of course, non-surgical causes of post-anaesthetic vomiting such as hypoxia (compare this with the vomiting of mountain sickness) and the use of analgesics such as morphine and pethidine. But in these instances the use of drugs which, while suppressing vomiting, may increase hypoxia by producing hypotension, or by prolonging central-nervous-system depression with their potentiation of anaesthesia, is not lightly to be recommended.

Various studies of a variety of remedies for post-anaesthetic vomiting have been made from time to time and, not surprisingly, the results differ widely. The large number of causes and the tremendous individual variation in response to a single causative factor, make the interpretation of the results particularly difficult. As an illustration of this we wish to report the preliminary results of a 'double-blind' study of 3 different phenothiazine derivatives, each of which has been recommended as a valuable post-anaesthetic anti-emetic.

METHOD

Bellville *et al.*[1] have shown that women are about 3 times more likely than men to vomit in the immediate post-anaesthetic period. These authors have also suggested that the incidence of vomiting is higher following intra-abdominal operations or in patients more deeply anaesthetized for some other reason. The ability of the anaesthetist himself can also affect the incidence.

In order to make the test as searching as possible and at the same time to eliminate as many variables as possible, the patients for this study were drawn entirely from adult women who were scheduled for abdominal hysterectomy or oophorectomy. They were all premedicated, largely with morphine or pethidine and atropine or hyoscine (Table I). All the anaesthetics were administered by a single anaesthetist who used a standardized technique.

TABLE I. PREMEDICATION AND INCIDENCE OF VOMITING

Premedicating drugs and doses	*Number of patients*	*Number vomiting*	*Comments*
Morphine, 11 mg., and atropine, 0·65 mg.	7	3	Proportion vomiting is 20/48ths. There is no significant difference
Pethidine, 100 mg., and atropine, 0·65 mg.	29	11	Proportion vomiting is 18/48ths. There is no significant difference
Pethidine, 75 mg., and atropine, 0·65 mg.	3	1	Remaining groups are too small for statistical consideration. As a whole, proportion vomiting is 20/48ths, which is not significant
'Omnopon', 11 mg., and atropine, 0·65 mg.	2	1	
'Omnopon', 22 mg., and atropine, 0·65 mg.	1	—	
'Phenergan', 50 mg., and atropine, 0·65 mg.	1	—	
Not recorded	5	3	
Total	48	19	

Induction of anaesthesia was with small doses (100 - 300 mg.) of a 2·5% solution of intravenous thiopentone and nitrous oxide (6 l. per minute) and oxygen (3 l. per minute) by inhalation. The gases were administered *via* the Magill circuit of a Boyle's machine. Ether was added until the depth of anaesthesia was such that the technique could be safely changed. Thereafter anaesthesia was continued and maintained by the administration of ether dripped on the gauze of a Schimmelbusch mask. This open-drop administration was continued until the operation was almost completed and the anaesthetic could be stopped. Relaxation was secured by deepening the anaesthetic.

As soon as the administration of the anaesthetic had ceased, the anaesthetist administered, by intramuscular injection, the contents of an ampoule of the drug to be tested. At the end of the operation the patient was returned to the ward and observed for the next 12 hours by the nursing staff who looked, in particular, for vomiting. Vomiting was defined in advance as the production at the mouth of any fluid or solid material, other than sputum, in association with retching and straining.

The ampoules of drug for injection were prepared

TABLE II. DATA CONCERNING THE PATIENTS TESTED, AND RESULTS OF TRIAL

Drug	*Dose*	*Age in years (mean and range)*	*Height in inches (mean and range)*	*Weight in lb. (mean and range)*	*Duration of anaesthesia in minutes (mean and range)*	*Number in group*	*Number vomiting*	*Proportion vomiting*
Distilled water ..	2 ml.	43 (27 - 73)	64 (61 - 66)	152 (95 - 230)	63 (35 - 110)	12	6	24/48
Largactil	25 mg. in 2 ml.	42 (26 - 63)	65 (63 - 67)	142 (120 - 170)	54 (37 - 118)	12	4	16/48
Siquil	10 mg. in 2 ml.	37 (21 - 50)	63 (61 - 65)	129 (90 - 215)	63 (27 - 114)	12	3	12/48
Trilafon	5 mg. in 2 ml.	37 (28 - 46)	63 (60 - 64)	123 (110 - 150)	65 (30 - 113)	12	6	24/48
Whole group ..		39 (21 - 73)	64 (60 - 67)	137 (90 - 215)	61 (27 - 118)	48	19	19/48

in advance by someone else. In each instance the fixed dose of drug was made up to a volume of 2 ml. with sterile water and sealed in a sterile ampoule. The ampoules carried no identifying mark other than a number drawn at random from a pool of 360 numbers at the time of preparation. Only the person preparing the ampoules held the key relating the number of an ampoule to its contents. In order to provide an internal control, 1 batch of ampoules was filled with sterile distilled water only. The others contained either 25 mg. of chlorpromazine ('largactil'), 10 mg. of triflupromazine ('siquil'),* or 5 mg. of perphenazine ('trilafon').** There was an equal number of ampoules in each batch but they were all stored loosely in a single box before being handed over to the anaesthetist who was to use them. In this way neither the anaesthetist, nor the nurses observing the patients, were aware of what drug any particular patient had received.

RESULTS

Data concerning the patients who were the subjects of this study, and the results of the study, are set forth in Table II.

The application of the chi-square statistical test to the observed results in Table II, using the mean values as the expected values, shows that only triflupromazine (siquil) might possibly be of value as a post-anaesthetic anti-emetic drug in the doses used and under the circumstances of the study. To prove or disprove the value of this drug under similar circumstances this study must be extended to a further 100 subjects, half of them being controls.

* Made available by courtesy of Messrs. E. R. Squibb and Sons, P.O. Box, 38, Isando, Transvaal.

** Made available by courtesy of Messrs. Scherag (Pty.) Ltd., P.O. Box 7539, Johannesburg.

DISCUSSION

Particular note should be taken of the fact that the results here reported apply only to adult women undergoing abdominal hysterectomy or oophorectomy under the type of anaesthetic described above. Furthermore, the results must be studied in the light of the fact that an entirely arbitrary choice of drug dose was made. It is quite possible that with different doses, under altered circumstances, and with quite another anaesthetic technique, drugs here studied might show different results. But side-effects such as hypotension and prolonged waking time might prove troublesome in turn.

To perform controlled experiments covering the multitude of variables which can be deliberately altered and controlled in a study of this nature, would make a life-work for a team of several people. If consideration is also given to the large number of variables over which the experimenter has no control whatever (such as patient idiosyncrasy, blood loss, duration of operation) it is apparent that chance will play a very large part in determining the results of the clinical testing of new drugs under the circumstances which too often obtain in such clinical trials.

To the thoughtful practitioner, attempts to determine the cause of post-anaesthetic nausea and vomiting, and efforts to eliminate these causes, would appear to be a far more reasonable line of advance.

SUMMARY

A clinical trial of anti-emetic drugs is reported. The trial was rigidly controlled and results are largely equivocal.

The information of value arising from a trial of this nature is discussed.

We thank Dr. J. G. Burger, Medical Superintendent, Groote Schuur Hospital, for permission to publish details of these patients.

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EDITORIAL : VAN DIE REDAKSIE

IS CONTROL OF OVULATION THE ANSWER TO BIRTH CONTROL AND POPULATION CONTROL?

The desire for pregnancy or the fear of pregnancy has dominated the minds of women and exercised the minds of men ever since man and woman were made for one another. While birth control is still essentially *a problem for the individual* living in a highly developed community under competitive circumstances, population control has become a desperately urgent *socio-economic problem* in most countries all over the world. In some of the overcrowded continents, for instance India, China, and some parts of Africa, overcrowding and famine still subject human beings to the law of the jungle — an unmitigated struggle for existence and the survival of the fittest. Present and potential increases in the world population are astronomical, and this fact is alarming to all thinking people; for food and *lebensraum* may well soon become completely insufficient to meet the needs of man — despite previously unheard-of technological advances.

In Japan legalized abortions have been sanctioned and are performed to the extent of about one million a year. In view of the magnitude of the problem it would, therefore, appear that basic principles and common-sense demand that this problem be approached on the basis of the prevention of conception rather than the termination of pregnancy. The problem of birth control is now merging into the wider problem of population control, and Malthus, who formulated his law of the disproportionate growth of population as early as 1798, is at last coming into his own.

Some easy, inexpensive, safe and successful method (with reference to both its use and effect) of popular birth control is urgently sought. These criteria for a satisfactory oral prophylactic drug are of extremely great importance, particularly to the masses, in any large-scale programme of population control. People in the higher socio-economic classes have, for many reasons, fewer children. Despite free availability and distribution in many areas of mechanical barrier-devices and chemical spermicidals, and despite the application of the rhythm or 'safe period' method and even coitus interruptus, birth control has failed in the hands of the very people needing it most — because a liberal measure of intelligence, responsibility, and self-discipline is mandatory for the successful application of all these methods of birth control. In addition to this consideration, there is the fact that members of certain religions are not permitted to practise birth control.

It is against this background that the recent introduction of ovulation control must be seen. The administration of oestrogens and/or progesterone, and recently nor-progestational compounds (synthetic progestins), place the ovaries on 'physiological rest' by inhibiting the formation of gonadotrophic hormone by the anterior pituitary. The progestins, when given from the 5th to the 25th day of a cycle, stimulate the development of a secretory (progestational, luteal) endometrium to resemble that of early pregnancy (pseudodecidual), with complete suppression of ovulation, and thus of fertility. The abrupt vaginal shift of cells at the time of ovulation is, however, invariably absent. A normal type of period follows one to four days after withdrawal, usually on the 28th day.

Since 1956, well-documented studies on the mass use of 'enavid' for long-term control of ovulation (for purposes of birth control) have been available, mostly based on pioneer work in the fertile fields of Puerto Rico. Several thousands of women, for many thousands of cycles, have been closely studied, at first on 10 mg. and later 5 mg. of 'enavid' daily in cyclic administrations of this drug. Not one became pregnant while taking either dosage as directed. There are no known contra-indications, and 5 mg. daily is, on all evidence, quite satisfactory for consistent control of ovulation. The cost is 15c per tablet, i.e. R3 per cycle, or R36 *per annum*.

The manufacturers advise that 'for cyclic administration over prolonged periods, a total of 24 months should not be exceeded until continuing studies indicate that its present lack of undesirable reactions continues for even longer periods'. The first post-treatment intermenstrual interval is commonly delayed to 35 days or more; later cycles revert to those typical for the individual concerned. Subsequent fertility was not impaired in the least, and pregnancies which started after the administration of 'enavid' had been discontinued, proceeded to the delivery of infants who were normal in every respect.

'Enavid' must be taken daily and it must be taken regularly every month, for the probability of ovulation multiplies rapidly with each day of non-medication, and withdrawal bleeding may also ensue. While 5 mg. daily will consistently inhibit ovulation, about a third of women will have 'spotting' or 'break-through' bleeding — usually only for the first month or two, when doubling the dose for a few days usually suffices. If persistent 'spotting' occurs, a higher dosage will be needed. Patients should appreciate that in about 1 out of every 100 treated 'cycles' a missed or 'silent' menstruation occurs which is not due to pregnancy, and that medication should be resumed not later than 7 days after the previous course. Only rarely does menstruation stay away for 2 or 3 consecutive months. Side-effects resemble many of the symptoms and signs of pregnancy, e.g. nausea (10%, seldom severe, usually improving within days or, rarely, after 2 or 3 cycles; may need anti-emetics), breast enlargement or mild engorgement, and fluid retention. Premenstrual tension may thus be intensified, for which a diuretic may be prescribed.

The control of ovulation is, therefore, a safe, easy, and successful form of birth control for the responsible individual, as indeed are the other considerably more inexpensive methods. When a contraceptive fails, it is *usually* because of failure on the part of the user, not because of any inherent defect in the device itself. Daily dosage on a strict cyclical régime may not succeed in the hands of less responsible persons. Is 'enavid', then, the solution to the urgent, almost universal, appeal for an

easy, inexpensive, safe, and successful method of popular population control? The answer is probably 'no' at this stage, but any further developments will be awaited with eager interest.

LANDSWYE INENTING TEEN POLIOMIËLITIS

Dr. Albert Hertzog, die Minister van Gesondheid, het op Vrydag 3 Maart in 'n radiopraatjie gesê dat die Regering besluit het om 'n landswye kampanje te onderneem, in Mei hierdie jaar, om alle vatbare persone van alle rasse teen poliomiëlitis te immuniseer. Ongeveer 6,000,000 persone sal dan ingeënt word, en die kampanje is daarop gerig om hierdie siekte totaal uit te delg. Suid-Afrika sal dan die eerste land ter wêreld wees, behalwe Rusland, wat so 'n omvangryke veldtog op so 'n groot skaal onderneem.

Teen hierdie tyd is almal wat in die saak belang stel reeds goed bekend met die hele agtergrond van die probleem. Ondersoekers soos Enders, Weller en Robbins[1] het die weg gebaan om Salk in staat te stel om aan die wêreld 'n entstof te gee van virus wat met formalien doodgemaak is, en wat in staat was om 'n immuniteit te weeg te bring wat vatbare persone beskerm teen dié vorms van poliomiëlitis wat verlamming veroorsaak. Daarna het navorsing onophoudelik voortgegaan en Koprowski, Cox en Sabin het daarin geslaag om 'n slukentstof van lewende, verswakte poliovirus voort te bring wat nie net verlammende vorms van polio voorkom op die basis van 'n aktiewe immuniteit nie, maar wat ook die spysverteringskanaal van die virus wat polio veroorsaak, suiwer.

Op grond van uitgebreide toetse wil dit voorkom of die stamme wat Sabin gebruik het die mees effektiewe sowel as die veiligste stamme is om 'n bevredigende slukentstof van nie-kwaadaardige, verswakte, lewende virus mee te maak. Dit is dan ook hierdie stamme wat gebruik is in die skitterende navorsing van dr. J. H. Gear en sy medewerkers, op grond waarvan ons eie slukentstof in hierdie land tot stand gekom het. Eksperimente in Mauritius en Kenia en, teen die einde van verlede jaar, in ons eie land, het aangetoon dat die entstof wat tot ons beskikking is, veilig en skynbaar doeltreffend is.

Om die immuniteitsgrondslag van die gemeenskap op 'n bevredigende grondslag te plaas, is dit nodig om so 'n groot persentasie as wat moontlik is (ten minste 80%) van die vatbare deel van die bevolking te immuniseer. Want slegs dan sal ons voorkom dat daar nie vatbare reste in die samelewing oorbly wat tot latere en kwaaiere epidemies kan lei nie. Dit beteken dat die entstof aan mense gegee moet word wat versprei is oor die lengte en die breedte van die land — in die stede, in die dorpe, op die plase, in lokasies, en in die groot reserwes. Elke vatbare persoon moet bereik word, en dit veronderstel aansienlike uitgawes en 'n baie groot organisasie.

Die Regering het besluit om die entstof vry beskikbaar te stel. 'n Onderneming van hierdie aard kan egter alleen slaag as die hulp en ondersteuning van 'n groot aantal vrywillige werkers uit alle sfere verkry kan word. Onder die leiding van sy beplanningsraad, is die Departement van Gesondheid alreeds besig om die planne vir die reuseorganisasie in gereedheid te bring; in medewerking met Provinsiale Administrasies, Stadsrade, Afdelingsrade, Regeringsdepartemente, Bantoe-outoriteite, skole, hospitale, en veral met die mediese professie en lede van die gewone publiek wat vol gees is vir die algemene welsyn. Daar word die hoop en verwagting gekoester dat alle dokters heelhartig sal saamwerk op die grondslag van 'n ware gemeenskapsdiens.

Ons het alreeds by 'n vorige geleentheid[2] 'n artikel geplaas deur dr. Cooper, Mediese gesondsheidbeampte van die stad Kaapstad, en dr. Robertson, waarin hulle hul ondervindinge beskryf wat hulle gedurende die Oktober-November kampanje verlede jaar opgedoen het. Hierdie waarnemings behoort van groot waarde te wees by die beplanning van die voorgenome veldtog. Ons hoop ook om lede van die mediese professie op die hoogte van sake te hou deur die publikasie in die *Tydskrif* van alle verwikkelinge in hierdie verband. Informasie aangaande die organisatoriese, tegniese, en wetenskaplike aspekte van die veldtog, sal gepubliseer word soos dit ontvang word van die Departement van Gesondheid of van sy beplanningsraad.

Laat ons as 'n mediese professie soos een man saamstaan om hierdie unieke geleentheid om 'n ware volksdiens te bewys, ten volle te benut. Ons sal daardeur nie net die naam en status van ons eie land op mediese gebied verhoog nie, maar ons sal aan die wêreld toon dat ons as 'n professie, ten spyte van wat daar tot ons nadeel gesê en gedink is gedurende die laaste aantal jare, nog die grootste voorrang gee aan die ideaal van selflose naastediens.

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CAMPAIGN TO WIPE OUT POLIOMYELITIS

Further points of information have been received from the Chairman of the Advisory Council, Department of Health, concerning the National Campaign for immunization against poliomyelitis, which was announced by Dr. Albert Hertzog in a broadcast on Friday 3 March. Reference to the Minister's announcement was made in an Editorial article which was published in the *Journal* on 18 March. The announcement is also discussed (Van die Redaksie) in this issue of the *Journal*.

The campaign will take place from the end of May to August 1961 and the exact dates for various areas are to be fixed as soon as information from the numerous local authorities becomes available. As announced by the Minister, the vaccine itself will be supplied free of charge to everyone. The Laboratories at Rietfontein will take care of the packaging and distribution of vaccine to the main centres indicated by the Department of Health. The Department of Health is the sole authorized supplier of vaccine to the local authorities and the teams under its own direct control; general practitioners will, therefore, not be able to obtain vaccine for private patients. This decision was taken after due deliberation and in the light of the facts that the campaign will be unique; that the handling in frozen containers is essential and may be

difficult; that vaccination is to take place in a restricted period of time (within 4 days) as simultaneously as possible with Union-wide coverage; and that uniformity is to be achieved and the potency of the vaccine to be tested by follow-up.

As indicated in the memorandum on oral poliomyelitis vaccine, which is published elsewhere in this issue of the *Journal*, the population at risk is based on the following age and racial groups: Bantu (reserves) 3 months - 6 years; Bantu (other) 3 months - 9 years; Asians (Natal rural) 3 months - 9 years; Asians (other) 3 months - 29 years; Coloured people 3 months - 29 years; and Europeans 3 months - 29 years. This means that approximately 5·7 million people will be vaccinated during this campaign. Serological surveys in South Africa have shown that the Bantu at the age of 10 years has the same immune status, i.e. almost complete protection against all three poliovirus types, as the European at 30 years of age. About 80% of paralytic poliomyelitis occurs in European children of 6 years and under, and in Bantu children of 5 years and under.

Each vaccinee is to receive 3 doses of vaccine, so that the total number of doses approximates 18 million. In addition to the above groups, all pregnant women and all immigrants from Europe and North America will receive cover.

ANATOMY AMENDMENT BILL

From Our Parliamentary Correspondent

Both Houses of Parliament have agreed in principle to legislation designed to make adequate supplies of clinical material more readily available to the anatomy departments of medical schools. Having been approved by the Senate, the Anatomy Amendment Bill, which has already passed the second reading stage in the House of Assembly, now only has to be considered in committee and be read a third time in the Lower House before it becomes law.

It was an unusual subject for members of Parliament, and they were unusually solemn as they considered its implications. The Deputy Minister of Education (Mr. John Vorster), who introduced the Bill, prefaced his remarks by saying that it was a short piece of legislation, 'morbid on the one hand, but very necessary on the other'.

The Meaning and Implications of the Bill.

He said the Bill had two principles, one of which was to make adequate supplies of clinical material more readily available, and the other to facilitate the administration of existing legislation relating to anatomy studies.

Previously the bodies used at medical schools were those of paupers who had been maintained by the state, but in terms of the new legislation it would be possible to use the body of anyone who was known to be a pauper at the time of his death, as long as it was not claimed by relatives or friends.

The Bill was also designed to make it possible for a person to make his body available for study purposes by his expressing a desire to do so in front of two competent witnesses. A spouse would now also be allowed to give the body of his or her deceased wife or husband to a medical school, and the parents of a dead or stillborn child could act in the same way regarding the body.

It would now be possible, too, for bodies to be kept for two years instead of 18 months, and the Anatomy Inspector would be allowed to delegate some of the duties which he previously was supposed to carry out personally.

Discussion.

Dr. Louis Steenkamp (U.P., Hillbrow) assured the Deputy Minister of his party's support and congratulated him on the Bill.

Dr. Ephraim Fisher (U.P., Rosettenville) said he did not think the Bill was going to meet the purpose for which it was designed. 'I cannot see any rush of people to will their bodies to medical schools; I cannot see a sudden rush of bodies to the dissecting tables', he said. He appealed for an extension to 30 days of the existing 14-day period that a body had to be kept before it could be used for anatomy purposes. He cited the example of Natives in the territories having difficulty in claiming their dead on the Rand within the prescribed 14 days.

Dr. Fisher did not like the idea of a person who was ill being entitled to bequeath his body orally, in front of *any* two witnesses, to a medical school. It might come as a shock to the person's family and for this reason a member of the family should be one of the witnesses. He said: 'If two probationers say "so-and-so said this to us" it is going to take an awful lot of investigation to get that dead man to deny that he said it'.

The Minister of Transport (Mr. Ben Schoeman): 'He will not worry about it.'

Dr. Fisher: 'No, he will not worry about it, but where does it say that his next of kin can argue the case for him?'

The doctor also objected to the principle of parts of a body being removed for study and the rest being buried — mutilation, as he put it. 'Excavators at some distant date might come across a body with three arms and five legs', he said.

Greater use should be made of synthetic materials for studying anatomy. 'It is amazing wha' can be done today with plastics', he added. 'The models that are being used are almost as good as the real thing.'

The Minister of Lands (Mr. Paul Sauer): 'Is it difficult to tell the difference between synthetic brains and ordinary brains?'

Dr. Fisher also suggested that the bodies of habitual criminals and other individuals who had been a burden on the State for many years should be used.

Capt. B. H. Henwood (U.P., Maritzburg District): 'A sort of *quid pro quo*?'

When Dr. Aubrey Radford (U.P., Durban Central), who is Inspector of anatomy examinations for the South African Medical Council, entered the debate he seemed to do so somewhat reluctantly. He said he was perhaps even more surprised than most members by Dr. Fisher's contribution to the debate. The latter had created a wrong impression when he said that bodies were not kept together. 'I did not intend to describe the sombre details of the anatomy room,' he said, 'but I should hate honourable members to think that parts are thrown about the room, that they are mixed up and that they are tumbled together in a sack and later thrown into a hole'.

He did not agree that if a man had said in front of two witnesses that he wanted to help medicine that that should be disputed. Nor did he agree with Dr. Fisher's impression of a man on his deathbed wanting to make his body available for study. People did not think about such things at such times, he said. He emphasized the importance of anatomy to medical science and said that no amount of plastic or synthetic substances could take the place of actual body tissues.

Dr. Radford painted a picture for the House of the jealousy with which a group of students guarded the various parts of the body allocated to them. He told them how all parts were kept together and eventually buried together.

After thanking Dr. Radford for the erudite manner in which he had assisted him to put over a rather ticklish subject, the Deputy Minister said: 'I somehow got the idea that he would have liked the honourable member sitting next to him (he and Dr. Fisher share a bench) to have been a student of his just at that moment, because I think he would have taken great pleasure in plugging him'.

Mr. Vorster said he was not prepared to consider having the bodies of habitual criminals used for anatomy purposes, and he intimated that there might be some amendment on the question of willing of bodies so that relatives might have some say.

ACUTE ACETONE POISONING DUE TO A SYNTHETIC PLASTER CAST

WITH A DISCUSSION OF ACETONE METABOLISM

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Poisoning with acetone appears to be extremely rare. In spite of the extensive use of this substance in industry hardly any cases of poisoning, presenting with more than slight drowsiness and nausea, were described before 1944. Since then there have been 8 recorded cases,[2,5-8,15,17,20] each one associated with the application of a synthetic plaster substitute consisting of glass and textile bandages, set by means of a fluid composed chiefly of acetone.

The clinical presentation of these cases has always followed a similar pattern, and the present case again shows all the leading features of acetone poisoning from this source.

CASE REPORT

An Indian boy, aged 7, was admitted to King Edward VIII Hospital on 9 February 1960 with a week's history of pain in his right thigh. He was found to be suffering from osteomyelitis, and the femur was drilled and pus evacuated. Culture revealed the presence of *Staphylococcus aureus*. In spite of treatment with penicillin and streptomycin the patient developed meningitis 3 days later, which responded rapidly to oxytetracycline and sulphonamides systemically, and penicillin intrathecally. After 1 week all signs had disappeared and the cerebrospinal fluid was normal.

His fever remained high, however, and on 26 February he developed the typical signs of purulent pericarditis. Treatment was changed to erythromycin in large doses, but he remained desperately ill for over 2 weeks, recovering shortly after the administration of kanamycin. Fever still persisted and he was found to have a purulent effusion in the right knee. This was aspirated and a plaster of Paris hip spica was applied, kanamycin and tetracycline being continued meanwhile. The fever then subsided slowly, the pulse rate ranged from 80 - 100 per minute and the boy appeared well and happy. On 16 May the haemoglobin was 14·3 g. per 100 ml., and the basal sedimentation rate 40 mm. per hour (Wintrobe). There were no abnormal findings in the urine.

The plaster had become badly soiled and a hip spica of a commercial preparation consisting of material lighter than plaster of Paris, together with pure acetone (solvent-evaporating agent) was applied over stockinette at 2.30 p.m. that day. An electric fan was blown over the cast for 45 minutes to ensure adequate ventilation and evaporation. As the weather was cold the patient curled up with his head under the blankets.

After 6 hours the nurses noticed that he was quiet and withdrawn, but he seemed to go to sleep normally.

After 18 hours he was still very drowsy, restless and fretful, sweating profusely and complaining of abdominal pain. He then began to vomit repeatedly with altered blood in the vomitus. The pulse rate was 160 per minute.

After 22 hours he was found to be drowsy and irritable but able to answer questions intelligently. He complained bitterly of thirst and greedily sipped water, even though drinking repeatedly caused further vomiting of coffee-ground material. The pulse was regular, rate 160 per minute, and of good volume. The temperature was normal. The patient was tender in the epigastrium and suprapubically. Breathing was deep and sighing, but irregular in rate. There was a smell of acetone in his breath, much more pronounced than we have ever noticed in any patient in diabetic coma. The tongue was dry and furred, but he did not otherwise appear dehydrated. There was no neck stiffness, but the movements of his hands seemed clumsy and badly coordinated. There was marked nystagmus. The pupils were normal in size, but reacted poorly when illuminated from the left, briskly when the light came from the right. Perimetry could not be carried out.

Lumbar puncture revealed a normal fluid except for a sugar content of 114 mg. per 100 ml. The urine gave a green reaction with Benedict's solution and contained much acetone. Serum electrolytes were as follows (in milli-equivalents per litre): alkali reserve 23·1, sodium 133, potassium 4·9, and chlorides 89. The blood sugar (after 20 hours' fasting) was 170 mg. per 100 ml.

It was decided to leave the cast undisturbed and to administer nothing but water by mouth.

After 28 hours the patient was vomiting less frequently and there was no more blood in the vomitus. Drowsiness, irritability and thirst continued, the pulse rate was still 150 per minute, and the temperature 100°F. His breath still reeked of acetone.

During the period 40 - 52 hours after application of the cast, the boy gradually became less drowsy. There was no

TABLE I. URINARY FINDINGS THROUGHOUT THE EPISODE OF ACUTE ACETONE POISONING

Time and date	*pH*	*Albumin*	*Sugar*	*Rothera test*	*Gerhardt test*	*Deposit*
17 May:						
1 p.m.		trace	+	+++		triple phosphate, urate
6 p.m.	5·5	trace	nil	+++		
8 p.m.	7	nil	nil	+++		
10 p.m.	6	nil	nil	+++		
18 May:						
6 a.m.	6·5	nil	nil	+++	pos.	
12 noon	6·5	trace	nil	+++		
2 p.m.	5·5	nil	nil	+++	pos.	epithelial cells
6 p.m.		nil	nil	+++		
10 p.m.		trace	nil	trace (??)		
19 May:						
6 a.m.	4	+	nil	+++		epithelial cells
10 a.m.	6	nil	nil	+++	pos.	epithelial cells
12 noon		nil	nil	+++	pos.	
2 p.m.	6	nil	nil	+++	pos.	
6 p.m.	5·5	nil	nil	++	neg.	
10 p.m.	5·5	nil	nil	++	neg.	
20 May:						
6 a.m.	6	nil	nil	trace		

pos. = positive, neg. = negative.

TABLE II. COMPARISON OF PRESENT CASE WITH OTHER REPORTED CASES

Cases	1	2	3	4	5	6	7	8	9
Sex	M	M	M	M	M	M	M	M	M
Age	7	7	7	7	7	7	7	7	7
Race	Indian	Indian	Indian	Indian	Indian	Indian	Indian	Indian	Indian
Fracture	Femur	Femur	Femur	Femur	Femur	Femur	Femur	Femur	Femur
Infection	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus
Meningitis	+	+	+	+	+	+	+	+	+
Pericarditis	+	+	+	+	+	+	+	+	+
Pleural effusion	+	+	+	+	+	+	+	+	+
Plaster	Commercial	Commercial	Commercial	Commercial	Commercial	Commercial	Commercial	Commercial	Commercial
Acetone	Pure	Pure	Pure	Pure	Pure	Pure	Pure	Pure	Pure
Time in cast	52 hrs.	48 hrs.	48 hrs.	48 hrs.	48 hrs.	48 hrs.	48 hrs.	48 hrs.	48 hrs.
Vomiting	+	+	+	+	+	+	+	+	+
Drowsiness	+	+	+	+	+	+	+	+	+
Irritability	+	+	+	+	+	+	+	+	+
Thirst	+	+	+	+	+	+	+	+	+
Tachycardia	+	+	+	+	+	+	+	+	+
Acetone breath	+	+	+	+	+	+	+	+	+
Nystagmus	+	+	+	+	+	+	+	+	+
Coma	+	+	+	+	+	+	+	+	+
Recovery	+	+	+	+	+	+	+	+	+

TABLE II. COMPARISON OF PRESENT CASE WITH OTHER REPORTED CASES

	Cases 1	2	3	4	5	6	7	8	9
Author	Strong[20]	Chatterton[5]	Pomerantz[15]	B.M.J.[3]	Cossman[6]	Harris[8]	Renshaw[17]	Fitzpatrick[7]	Present case
Age (yrs.); Sex	42; M	10; F	32; F	3; M	12; M	10; M	1½; F	21; F	7; M
Blower used	Yes	Yes	No—ambulant	No	No	No	No	No	Yes
Onset (hours)	10	10	12	1	?	9	12	? 1	? 6
Vomiting	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Haematemesis	Yes	Yes	No	No		Yes	Yes		Yes
Abdominal pain	Yes					Tightness			Yes
Bladder pain	Yes								Yes
Thirst						++			++
Respiration	Kussmaul	Kussmaul		Shallow	Deep, slow	Rapid, irregular, later apnoea	Slow, quiet		Deep, sighing
Hiccoughs	Yes					Yes			
Acetone in breath	++++	++++	++++	++++	++++	++++	++++		++++
Pulse (per min.)	100 - 120 irreg.	120	120	Rapid	Rapid, feeble	132	120		160
Blood pressure (mm. Hg)	130/90	Normal				80/60	90/65		
Pallor			Yes			Yes			
Drowsiness	+	+	+	+	+	+	+	+	+
Eyes					Mydriasis		Meiosis. Hippus		Nystagmus. ? Hemianopia
Tendon jerks						Brisk	Absent		Brisk
Dysarthria	Yes					Yes			
Urine: acetone	++++	++++	++++	++++	++++	++++	++++		++++
sugar	++	+++	+++			+	+		+
diacetic acid						++			++
albumin	+++	Trace	Nil				Nil		Trace
Dysuria	Yes		Yes						Yes
Blood sugar	306 mg.								170 mg.
Allergy	Wheals	Nil				Nil			Nil
Treated with glucose	Yes	Yes	Yes	No	No	Yes	No	Yes	No
Treated with insulin	Yes	No	No	No	No	No	No	No	No
End of episode (days)	5	3	1½	? 2		4	1	? 1	3½

B.M.J. = *British Medical Journal.*

more vomiting. The pulse rate slowly subsided from 140 to 100 per minute, and nystagmus disappeared, but the pupillary signs remained.

After 66 hours the patient was alert and cheerful. Acetone was still present in his breath, but less noticeably so. There were no abnormal physical signs. Serum cholesterol was 210 mg. per 100 ml., blood sugar 112 mg. per 100 ml. and serum lipids 710 mg. per 100 ml.

After 90 hours acetone was barely perceptible in the breath, the pulse rate was 90 per minute, haemoglobin 12·8 g. per 100 ml., and the sedimentation rate 36 mm. per hour (Wintrobe).

The urinary findings during the whole episode are shown in Table I.

A glucose-tolerance test was performed 13 days after application of the cast. As the patient tended to vomit any glucose given orally, 25 g. were given intravenously and blood sugar was estimated before and at half-hourly intervals after injection. The results (in mg. per 100 ml.) were: 49, 225, 105, 49, 31, and 40. Sugar was found in the urine after 1 hour.

The test was repeated 2 months later, this time injecting only 12·5 g. glucose. The results then were (in mg. per 100 ml.): 84, 184, 115, 76, 84, and 100. Sugar again appeared in the urine after 1 hour.

COMPARISON WITH OTHER CASES

Table II compares our main findings with those in previously reported cases. It will be seen that cases 4 and 8 came on rapidly, but in these the narcotic features alone were present. In the others drowsiness came on after varying periods of time.

Vomiting, however, began fairly regularly after 10 - 12 hours. It was present in 7 of these cases and blood was reported in the vomitus of 5 of them. Acetone was found in the vomitus in case 7. In case 1 the evacuated gastric contents caused burns on the lips and cheeks. The presence of a gastric tube appeared to aggravate the mucosal irritation, leading to increased haemorrhage and mucosal sloughing.

Pain. Case 6 complained of tightness of the epigastrium, while in case 9 (the present case) pain over the stomach and bladder were marked features. In case 9, as well as in cases 1 and 3, dysuria was noticed.

Thirst was extremely marked in cases 6 and 9, quite out of proportion to any mild dehydration that may have been present.

Respiration was deep, slow and sighing in 5 cases, usually described as 'Kussmaul' or 'acidotic' in type. In case 2 it became very shallow. Case 6 breathed rapidly and irregularly at first, but later became apnoeic. Hiccoughs were also observed in cases 1 and 6.

Cardiovascular effects. Tachycardia was present in all cases. It was most marked in case 9 and the preceding pericarditis may have been a factor in this. The blood pressure remained unaltered in 7 cases, but in 2 there was peripheral vascular collapse. In 2 cases pallor was specially commented on, suggesting peripheral vascular constriction.

Effects on central nervous system. Drowsiness was the first symptom in each case. This led in some instances to an irritable torpor with unimpaired intelligence, in others to deep sleep or coma. Pupil size was variable as were the tendon reflexes. Dysarthria was common and incoordination was seen in case 9. Focal signs were few: hippus and independent eye movements in case 7, nystagmus and a doubtful hemianopia in case 9. In case 9 meningitis had been present 2 months previously, but these signs had not been noticed before the episode of poisoning and disappeared rapidly afterwards.

Urinary effects. Rothera's test invariably showed a very strong reaction outlasting all clinical signs. In the 2 cases where it was tested for there was also a positive reaction with Gerhardt's reagent on some occasions. Neither of these patients had been taking salicylates or any other drugs known to produce a positive reaction. Albuminuria was present at some stage in 3 cases, particularly in case 1 where it was reported as +++. Formed elements in the urine were inconspicuous. Sugar was found whenever the blood sugar was above threshold level. Dysuria and pain over the bladder occurred in cases 1, 3 and 9.

Glucose-tolerance tests were unfortunately not performed during the acute episode; after recovery in cases 1 and 9, they ruled out the possibility of diabetes in these patients, as did the normal fasting blood sugar in case 3. We can offer no explanation for the hypoglycaemic levels in the first glucose-tolerance test in case 9.

DISCUSSION

Absorption

The question whether acetone is absorbed through the skin or the lungs in these cases has repeatedly been discussed. In cases 1, 2 and 9 (the present case) an airblower was used continuously to dissipate the fumes, while case 3 walked about the streets for hours after application of the cast. In those cases it seems unlikely that the concentration of acetone vapour was sufficient for undue respiratory absorption to have occurred and direct absorption through the skin must be held responsible. The only experimental work on this aspect appears to have been done by Caesaro and Pinerolo[4] who claimed that acetone was not absorbed through intact skin. However, contact in their experiments was far less prolonged than in our clinical cases.

On the other hand case 6 had stayed in a heavily laden atmosphere for a considerable time and cases 6 and 9 had kept their heads under the bedclothes, thus gaining ample opportunity for the inhalation of acetone vapour. In case 7 the synthetic cast was applied over an existing plaster, so that there was no direct contact with the skin at all. In cases 6 and 9, therefore, acetone may have, and in case 7 must have, entered through the lungs. Browning[3] quotes Sack describing a case of acetone poisoning in a workman cleaning a large tank which had contained the substance. Here again, inhalation seems the only possible method of entry.

It would seem to us that acetone may, therefore, enter the body through either lungs or skin, or both.

Fate of Absorbed Acetone

Koehler *et al.*[9] injected 10 g. of acetone intravenously into human volunteers. They observed drowsiness as the only constant toxic effect and did not detect any increase in β-hydroxybutyric acid or glucose in the blood. The blood level of acetone remained practically constant for the first 4 hours. From this one might conclude that acetone is not metabolized to any appreciable extent.

On the other hand Price and Rittenberg[10] have shown that in rats the proportion of acetone excreted in the breath and the urine rises with an increase in the administered dose, suggesting that a small amount is removed by some other pathway and only the remainder is excreted. Work-

ing with C^{14}-labelled acetone they later showed that some, at least, of this removal is by way of oxidation to carbon dioxide.

Mourkides *et al.*,[18] also working with rats, confirmed this work and found that this oxidative removal accounted for part only of the metabolized acetone, the proportion falling with increasing dosage. Hence there must be still other pathways for the removal of acetone.

Some of these pathways have been elucidated. Borek and Rittenberg[1] showed that rats can carboxylate acetone to aceto-acetic acid and Plaut and Lardy,[14] working with liver slices, found that a much larger proportion of acetone is metabolized this way if the tricarboxylic-acid cycle is inhibited with malonate. The finding of a positive Gerhardt test in our cases 6 and 9 is fully in keeping with this and proves the importance of this pathway in man.

Sakami and Lafaye,[19] and after them Rudney,[16] again working with rats, proved the conversion of acetone partly to formate and partly to a 3-carbon compound, probably propane diol, which is known to be capable of entering the tricarboxylic-acid cycle, being metabolized to hexose and perhaps pentose as well. Again our finding of a raised blood-sugar level in cases 1 and 9 seems to support the occurrence of this mechanism in man.

Borek and Rittenberg[1] suggested that a further metabolic pathway of acetone was to cholesterol and other lipids. Kronfeld *et al.*,[10] on the other hand, found that in ketotic cows lipogenesis was inhibited. The finding of normal cholesterol and lipid levels in our case 9 does not provide any evidence for the existence of this pathway in man.

The demonstration of acetone in the vomitus of case 5 shows that after the absorption of large quantities some of the ketone is excreted by the gastric mucosa.

Fig. 1 represents schematically these various methods of disposal of acetone.

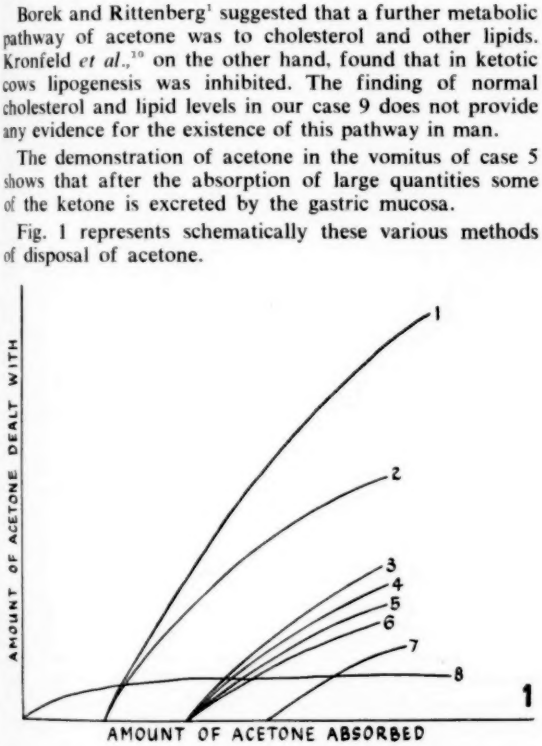

Fig. 1. Schematic representation of different pathways concerned with the removal of absorbed acetone: (1) excreted in breath, (2) excreted in urine, (3) metabolized to aceto-acetate, (4) metabolized to saccharides, (5) ?metabolized to lipids, (6) ?metabolized to other substances, (7) excreted in gastric mucosa, and (8) oxidized to CO_2.

Toxic Effects

Gastro-intestinal. Lewin[12] showed that acetone poisoning in rats produces hyperaemia of the mucous membranes of stomach and intestine. This fits in well with the frequent occurrence in the present cases of vomiting, haematemesis and occasional abdominal pain. The marked sloughing of the oesophageal mucosa in case 1 following upon the use of a rubber tube is also in keeping with this.

Thirst. The extreme thirst in cases 6 and 9, out of proportion to any dehydration present, suggests a direct effect on the thirst mechanism. It is not likely that the dryness of the mouth due to the deep respiration was the cause, for we have not found any comparable complaint in pneumonia.

Respiratory system. Landgren *et al.*[11] demonstrated a stimulating effect of acetone on the carotid body and sinus in cats, which they attributed to an anticholinesterase effect of the ketones. The present series of 9 cases suggests that in man an early stimulating effect is succeeded by a later inhibitory one. In case 6, in particular, rapid irregular respiration was later succeeded by slow, deep respiration, which gradually became shallower and eventually ended in complete apnoea. The fact that the deep, sighing respiration, usually described as 'Kussmaul' in type, is not due to acidosis is proved by the normal alkali-reserve levels in cases 1 and 9. It may be that the deep and rapid respiration is due to carotid sinus stimulation, the later shallow respiration being due to interference with the medullary respiratory centre. Irritation of the respiratory epithelium does not seem to be a feature of acetone intoxication.

Cardiovascular system. The carotid-sinus effect of Landgren *et al.*[11] may similarly be invoked to explain the marked tachycardia which was a leading sign in all cases. The fall in blood pressure and the pallor, suggesting peripheral vascular constriction, may also be attributed to such a mechanism. Here again, however, these signs are perhaps more likely to be due to a direct effect of acetone (or its metabolites) on the medullary vasomotor centres. It is interesting to note that the 2 cases (6 and 7), in which the blood pressure fell, also showed the shallow rather than the deep type of respiration.

Urinary system. The occurrence of dysuria in 3 cases is most easily explained as an irritative effect of the ketones on the bladder wall. Whether albuminuria should be attributed to the same cause is a moot point. It might equally well be due to kidney damage. Previous investigators have differed greatly in their views on the occurrence of renal damage in acetone poisoning.[8]

Central nervous system. The effects of acetone on the nervous system appear to resemble those of alcohol closely. Drowsiness is followed by an irritable torpor and later coma. Incoordination and dysarthria are common. Pupiliary signs, tendon jerks and other focal manifestations appear to be variable.

Relation to Diabetic Coma

From the foregoing it will be apparent how closely acetone poisoning can mimic diabetic coma. Drowsiness, variable nervous signs, thirst, ketones in breath and urine, raised urinary- and blood-sugar levels are common in both. Abdominal pain and peripheral vascular collapse may also

be a feature of either. Small wonder that several of the 9 cases under review were at one stage diagnosed as suffering from diabetic coma.

It is tempting to doubt whether the resemblance is a purely fortuitous one or whether these signs and symptoms, as they occur in diabetic coma, may not be, in part at least, due to endogenously formed acetone. Is diabetic coma in fact acute acetone poisoning?

Sensitivity

The question of hypersensitivity to acetone has been raised. This finds slight support in the discovery of wheals under the synthetic cast in case 1. No such marks were found in cases 2, 6 and 9 and patch tests in cases 7 and 9 were negative.

Treatment

We can see no theoretical reason why treatment with glucose should be effective in pure acetone poisoning. It was applied in 5 cases, presumably on the analogy of diabetic coma, but these patients fared no better than the 4 treated without it. In fact, case 1, which was treated intensively with both glucose and insulin, had the stormiest passage of all and took longest to recover. Koehler *et al.*[9] could not demonstrate any effect of glucose or insulin on the removal of acetone.

In our opinion the synthetic plaster should be removed to minimize skin absorption and plentiful fluids should be administered to ensure a good urinary output. A stomach tube should not be used for this purpose. Apart from this, symptoms should be treated as they arise.

Final Comment

This report is not intended to condemn, in any way, the use of synthetic light-weight casts, since the complication of acetone poisoning appears to be very rare. It should, however, make the medical attendant aware of the possibility of this complication and obviate the troubles resulting from a diagnosis of diabetic coma which is so easily made in these cases.

SUMMARY

A case of acetone poisoning due to the application of a synthetic plaster substitute is described.

The clinical and biochemical findings are compared with those in previously reported cases.

The metabolism and pharmacological action of acetone are discussed.

Absorption can occur through either skin or lungs. Excess acetone is either excreted in breath and urine or metabolized by several different pathways. The amount of acetone present determines the relative importance of these mechanisms. Some of the major end-products of metabolism are carbon dioxide, aceto-acetic acid, saccharides and possibly lipids.

The major toxic effects are drowsiness going on to coma, vomiting, haematemesis, thirst, and cardio-respiratory irregularities.

The close resemblance of acetone poisoning to diabetic coma is pointed out.

Symptomatic treatment alone is advised.

There is little evidence of a hypersensitivity reaction in acetone poisoning.

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NATAL MEDICAL STUDENTS' ATTITUDES TO THE SOCIAL AND PREVENTIVE ASPECTS OF MEDICINE

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With the increasing emphasis being laid by medical educators on the social and preventive aspects of medicine, it is of interest to know students' attitudes to this side of their training. Such attitudes reflect both the students' receptivity and their response to such teaching.

The present study was undertaken towards the end of the 1959 academic year at the medical school of the University of Natal. Students at this school have, since 1955, received instruction in social, preventive and family medicine during the last 3 years of their course. This training comprises family and community-based practical experience, including the clinical clerking of patients and families, and systematic lectures, case discussions and seminars. The practical teaching is centred at the Institute of Family and Community Health,* which provides a comprehensive health and medical care service for 2 neighbourhood communities. The teaching programme has been described elsewhere in detail by Kark.[1]

* This institute closed down on 31 January 1961, after this article was written.

Durban Medical Curriculum

The course at this medical school is spread over 7 years. In the initial, or 'preliminary' year, the subjects taught are history, English or Afrikaans, botany, zoology, physics and chemistry. In the next 3, or 'preclinical' years (the '1st' - '3rd' years), the subjects covered are botany, zoology, chemistry, physics, sociology, anatomy, physiology, psychology, pathology and pharmacological physiology. During the last 3, or 'clinical' years (the '4th' - '6th' years), the subjects are social, preventive and family medicine; medicine; surgery; obstetrics and gynaecology; and special subjects (radiology, forensic medicine and psychological medicine). The students at the school are African, Indian and Coloured.

METHOD

Self-administered questionnaires were used; these were anonymous, and their completion voluntary. The questions dealt with the students' views concerning factors contributing to disease, the rôle of the medical profession and other personnel, tuberculosis control measures, the opportunities provided by general practice, the attributes of a good doctor, patient management, and career choice. Some of the questions were based on those used by Merton and others in their studies of USA medical students.[2]

When stating their view of the importance of a factor, the students were asked to indicate whether its importance was major (or great), moderate, minor, or nil. In the results which follow, we use the unqualified term 'important' to indicate 'major' and 'moderate' responses (combined).

Neither the full list of questions, nor the full findings, will be presented. Details are, however, available from the authors.

Forms were returned by 39 (89%) of the preliminary-year students, 50 (54%) of the students in their preclinical years, and 44 (77%) of those in their clinical years. As occasional items were left unanswered, the number of responses to individual questions fell short, in some instances, of these totals.

In assessing the statistical significance of the findings, use was made of the significance tests provided by Armsen,[3] or, where these were not applicable, of the chi-square test (with Yates's correction).

TABLE I. STUDENTS' ATTITUDES TO SOCIAL AND PREVENTIVE ASPECTS OF MEDICINE: RESPONSES SHOWING SIGNIFICANT DIFFERENCES BETWEEN VIEWS OF CLINICAL AND OTHER STUDENTS

Statement	*Percentage of students making specified statement*			*P**
	Preliminary year	*Preclinical years*	*Clinical years*	
Factors contributing to disease:				
Harmful customs and beliefs are important ..	56	76	95	<·001 (A), <·05 (B), <·01 (C)
Inadequate use of medical facilities is important	80	80	95	<·05 (C)
Family disharmony is of great importance ..	13	6	34	<·05 (A), <·02 (B), <·001 (C)
Ignorance is of great importance	45	50	80	<·01 (A and B), <·001 (C)
Medical profession's rôle:				
The medical profession should play:				
an important rôle in organizing crèches and nursery schools	32	69	83	<·001 (A)
an important** rôle in preventing suicides	85	80	98	<·05 (C)
a rôle of major importance in preventing delinquency or crime	16	18	35	<·05 (C)
Rôle of other personnel in improving a population's health:				
Traditional healers play an important rôle ..	13	8	33	<·01 (B and C)
Faith-healers play an important rôle	30	14	42	<·01 (B), <·02 (C)
Measures in combating tuberculosis:				
The following are of major importance:				
Tracing contacts	67	52	88	<·05 (A), <·001 (B), <·01 (C)
Increased wages	49	56	81	<·01 (A), <·02 (B), <·001 (C)
Suitable employment of partially disabled persons	36	31	62	<·05 (A), <·01 (B and C)
Feeding schemes	58	56	71	<·05 (C)
Opportunities provided by general practice:				
A contribution of major importance to more effective practice is made by the opportunity to:				
care for the patient over a long period ..	42	60	83	<·001 (A), <·05 (B), <·01 (C)
treat the family as a whole	26	37	74	<·001 (A, B and C)
see the patient's house	24	26	50	<·05 (A and B), <·01 (C)
get to know the patient's relatives	5	8	41	<·001 (A, B and C)
treat patients at home	8	8	29	<·05 (A), <·02 (B), <·01 (C)

As occasional responses were omitted, the number of respondents varies from item to item. The numbers were: preliminary year, 37-39; preclinical years, 46 - 50; clinical years, 41 - 44.

* Probability that the difference between the clinical and other students may be due to chance. A = comparison with preliminary year students, B = comparison with preclinical students, C = comparison with preliminary year and preclinical students (combined).

** Including 'of minor importance'.

TABLE II. CLINICAL STUDENTS' ATTITUDES TO SOCIAL AND PREVENTIVE ASPECTS OF MEDICINE: RESPONSES SHOWING SIGNIFICANT DIFFERENCES BETWEEN VIEWS OF FINAL-YEAR STUDENTS AND 4TH AND 5TH YEAR STUDENTS

Statement	*Percentage of students making specified statement*			*P**
	4th year students	*5th year students*	*Final-year students*	
Factors contributing to disease:				
Harmful customs and beliefs are of major importance	27	53	75	<·05**
The inadequate use of medical services is of major importance	27	53	71	<·05
Family disharmony is important	36	86	75	<·05**
Rôle of other personnel in improving a population's health:				
Clinical psychologists play a rôle of major importance	33	33	82	<·01
Farmers play a rôle of major importance	21	45	75	<·05
Priests play a rôle of major importance	0	6	41	<·01
Traditional healers play an important rôle	17	15	59	<·01
Measures in combating tuberculosis:				
The provision of suitable employment for partially disabled persons is of major importance	18	64	88	<·01
Home care of patients is important	73	71	100	<·05
Opportunities provided by general practice:				
A contribution of major importance to more effective practice is made by the opportunity to treat the family as a whole	45	73	94	<·05

As occasional responses were omitted, the number of respondents varies from item to item. The numbers were: 4th year, 11 or 12; 5th year, 13 - 15; final year, 16 or 17.

* Unless otherwise stated, the probability that the difference between the final-year students and the 4th and 5th year students (combined) may be due to chance.

** Final-year and 5th year students (combined) compared with 4th year students.

RESULTS

Preliminary and Preclinical Years

The responses of preliminary-year students indicated a considerable awareness of the importance of the social and preventive aspects of medicine. More than 90% regarded poverty, a poor diet, insanitary conditions, and poor housing as being important factors in the production of disease. More than 80% thought that the medical profession should play an important rôle in combating malnutrition, in improving housing standards, in public-health education, and in marriage guidance. More than 80% considered that social workers, teachers, sanitary engineers, food inspectors, clinical psychologists, farmers, and health educators played an important rôle in improving the health of the population. More than 80% considered that, in combating tuberculosis, important measures were the tracing of contacts, social-welfare assistance to patients and their families, improved housing, public-health education, mass radiography, feeding schemes, and the provision of suitable employment for disabled cases. More than 90% stated that an important contribution to effective practice was provided by the opportunities offered by general practice to trace the contacts of infectious cases, to help prevent diseases from spreading, to detect disease early, to encourage healthy living habits, and to play some part in dealing with medical problems on a broad community level.

The responses of students in their preclinical years were, in general, very similar to those of the preliminary-year students.

Clinical Years

The students in their clinical years tended to place considerably more weight on social and preventive aspects than did other students, the differences attaining significance in a number of instances. Responses showing such differences are listed in Table I.

There tended also to be differences among the 3 clinical years, students who were nearer the end of their course laying greater stress on social and preventive aspects. A number of these differences were significant (Table II); there were no significant differences in the reverse direction.

The clinical students' responses to a series of questions concerning patient management showed that most of them were aware (particularly so in their final year) of the importance to the clinician of the patient's nutrition, his knowledge and attitudes, and his relationship with the doctor, and the value of patient education and of making contact with the patient's relatives. Asked how they would react if their classmates used specified procedures in handling patients, more than 75% said that they would approve of a detailed nutritional examination, of the use of colloquial or lay terms in explanations to patients, and of endeavours to seek out the patient's relatives at visiting hours. Asked whether, in their view, the failure of some patients to carry out their doctors' prescribed treatment was usually the fault of the patient, the doctor, or both, 71% stated 'both', 7% said 'the patient', 5% 'the doctor', and 17% 'did not know'.

Asked their views on the importance of a number of possible reasons for a patient's non-compliance with his prescribed treatment, they stressed the patient's view of his illness and the treatment, and his relationship with the doctor. His understanding of how the treatment would affect his condition was regarded as of major importance by 76% of the final-year students, but by only 31% of the 4th and 5th year students ($P < .01$). Almost all (94%)

of the final-year students regarded an ability to establish rapport as a very important criterion of a good doctor or student, compared with 64% of the 4th and 5th year students ($P < .05$). Asked whether, if they felt especially sympathetic towards a patient, they thought this would have a bearing on his management, only 6% of the final-year students responded 'so far as I know, it would make no difference', compared with 44% of the 4th and 5th year students ($P < .05$).

DISCUSSION

The findings indicated a considerable awareness of the importance of social and preventive aspects in all the years of study, with a progressive increase during the 3 clinical years. It appeared that, with increasing clinical experience, students tended to lay more stress on these factors. The general consistency of the findings was such that this conclusion was not greatly affected by doubts stemming from the small size of the sample, or the cross-sectional nature of the study. This interpretation, namely that students tended to change during their clinical years, was in full conformity with the impression gained by the authors as a result of contact with the students studied, and the 2 groups of students who had previously passed through the department and had already graduated. It was noteworthy that, although some change was apparent towards the end of the 4th (or 1st clinical) year, it was apparently only in the students' 3rd year of clinical training that a number of these changes developed.

Whether this receptivity applies also to students elsewhere, cannot be answered by this study. The students at this school may be particularly receptive. As members of non-White communities, many of them come to their training with personal experience of the social, emotional and cultural problems of underprivileged groups. They are aware of the higher morbidity and mortality in these groups, of their lower standards of living and their shortcomings in health behaviour. The urgent need for health education and other measures to combat malnutrition and infections is widely realized, and often featured in the lay press. In their own lives, many of the students have come into contact, directly or indirectly, with the problems of poverty, urbanization, industrialization, and migrant labour, and their effects on family solidarity and personal health. Moreover, most of the students intend to enter general practice; this may stimulate their interest in family care and the practical problems of the family physician.

Such predisposing factors apart, the clinical students at this school are repeatedly confronted with cases of pellagra, kwashiorkor, gastro-enteritis, amoebic dysentery, tuberculosis, and other preventable diseases which have obvious social and cultural determinants and important social implications. In addition, throughout their clinical years they have practical experience in social, preventive and family medicine, specifically directed towards sharpening and intensifying their understanding of the social and cultural implications of health and disease.

The question whether the same awareness would have been achieved without specific teaching of this kind can, of course, not be answered by a study of this nature alone. To an extent however, the findings of this attitude study can be considered as providing evidence, as has a recent evaluation of the Aberdeen family-medicine teaching programme,[4] of the value of specialized teaching of this sort in the medical curriculum.

SUMMARY

A study of medical students' attitudes to the social and preventive aspects of medicine was conducted at the University of Natal, at which clinical students receive a 3-year course in social, preventive and family medicine.

The findings indicated a considerable awareness of the importance of such aspects in all the years of study, with a progressive increase during the clinical years.

We are indebted to the students, and to Prof. I. Gordon, Prof. E. B. Adams, and Dr. B. Gampel for their assistance.

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MEMORANDUM ON ORAL POLIOMYELITIS VACCINE

From the Poliomyelitis Research Foundation, Johannesburg

Preparation

This orally administered vaccine consists of suspensions of live poliovirus prepared from the highly attenuated strains of all 3 types developed by Prof. A. B. Sabin of the United States of America. The virus suspensions are propagated on monkey kidney tissue and processed and tested by methods based on his recommendations. The vaccine has been approved for release by the Union Health Department. It has been shown to be free of extraneous pathogenic viruses. It does not produce paralysis in monkeys by intracerebral inoculation of large doses.

The following virus strains, obtained from Professor Sabin, were used in the preparation of the vaccine: *Type* 1 : L Sc 2 ab, *Type* 2 : P 712 Ch 2 ab, *Type* 3 : Leon 12 ab.

The vaccine contains no preservative. The normal acceptable colour, due to phenol red indicator, is varying degrees of cherry red. The variation in colour is due to a varying content of CO_2. Loss of CO_2 during use increases the depth of the colour, but has no effect on the efficacy or safety of the vaccine. A yellow colour or lack of transparency is an indication for discarding a container of vaccine. When enclosed in containers with CO_2 ice under pressure, vials occasionally acquire a yellow colour due to excess CO_2 gaining admission to the vial. This colour reverts to cherry red on exposure to atmosphere when dilutions are made and such vials are fit for use.

Dosage

The recommended dose is at least 100,000 tissue-culture doses (T.C.D.) of virus or roughly 100,000 virus particles of each type of poliovirus. The object of the vaccination is to produce a symptomless intestinal infection of the 3 virus types with the development of homologous antibodies to the 3 virus types. This intestinal infection is followed by an intestinal immunity and resistance to further infection by wild paralysis-producing poliovirus or by attenuated vaccine strains. Virus dosage lower than the recommended 100,000 T.C.D. may result in a lower percentage of 'takes' or 'immunogenic activity'. This may be due to loss of potency from exposure to unfavourable temperature and other conditions, chemicals, and contamination during handling, or overdilution.

Potency

At the time of manufacture the concentrated vaccine contains in excess of 10,000,000 tissue-culture doses per ml., i.e.

100 human doses per ml. or one human dose per 0.01 ml. If the concentrated vaccine is diluted 1/50 (i.e. 1 ml. vaccine in 49 ml. sterile saline or chilled sterile syrup simplex B.P., or the specially prepared raspberry-flavoured syrup) *0·5 ml.* will contain one human dose. The volume of the concentrated vaccine is usually ignored and the virus fluid added to 50 ml. diluent.

Methods of Use

The object of the vaccination is to introduce into the alimentary tract sufficient viable virus to cause an infection with the faecal excretion of virus for an average period of about 30 days.

This can be achieved by squirting a measured dose of suitably diluted vaccine fluid into the mouth by syringe or feeding it by teaspoon. It can be added to sugar water, saline, milk, plain sucrose syrup, granulated sugar, sugar lumps, or a suitable type of plain sweet that has absorbent properties and has approved flavouring and colouring ingredients that have been shown not to have a detrimental effect on the viability of the attenuated poliovirus.

Automatic Syringe Method

This method is suitable for mass administration because of ease and speed of administration. The automatic syringe consists of a 2 ml. syringe with a spring loaded plunger in a metal holder. To this is attached a valve holder.

A length of rubber tubing allows virus fluid to be drawn into the valve fitting and to be ejected through a needle or cannula attached to the front.

The plunger is set at 0.5 ml. and that volume of fluid is sprayed onto the back of the vaccinnee's throat. The rubber tubing passes through a rubber sealed screw cap into the diluted virus fluid contained in an 8 oz. Boston round type flask or suitable plastic bottle.

Dilution

The flask is marked at the 50, 100 and 150 ml. levels and 1, 2 or 3 ml. of concentrated virus fluid, after minimum thawing under cold tap water, is withdrawn under strict aseptic precautions and introduced into the chilled sterile bottle. The vial is immediately re-frozen. The volume is made up to the required level with cold sterile diluent: sugar water, raspberry syrup, etc. In this 1/50 dilution, 0.5 ml. will contain at least 100,000 T.C.D., i.e. *one* human dose. This container is kept cold by surrounding it with ice cubes in a wide-necked thermos flask or similar insulated container.

Dropper Pipette

Glass tubing of suitable diameter is fitted into the cap of a Boston round flask and a teat attached. The Boston round flask is marked at 50, 100 and 150 ml. levels; 1 ml. of vaccine for every 10 ml. of diluent vaccine is introduced. The volume of the concentrated vaccine is ignored. The dilution is regarded as being 1/10 ml. of this dilution and contains sufficient vaccine for 1,500 individuals. The dose of 0.1 ml. is contained in one drop of the calibrated pipette. This can be dropped on granulated sugar, sugar lump, syrup, milk, or infants food and fed to the vaccinee. The flask must be kept in contact with ice.

Sweets, Pastilles, Etc.

For small numbers or for difficult children pastilles and sweets may be used and can be ordered in limited quantity.

Vaccination Schedule

The ideal approach is to administer each strain separately and to give a fourth feeding of trivalent vaccine. Thus, types 1, 3 and 2 are administered at a minimum of 2 months apart, and this is followed up after at least 2 months by a feeding of trivalent vaccine. The minimum two-monthly period is laid down to ensure as far as possible a complete elimination of the previous virus from the intestinal tract so as to minimize interference between virus types, thus increasing the percentage of 'takes', i.e. immunogenic efficiency.

It has also been found that the administration of trivalent vaccine on 3 occasions gives very satisfactory results. This has the advantage that complete immunity can be achieved in about 70% of individuals by one feeding and is therefore indicated where 100% of the vaccinees are not expected to complete a regular course. This is the rule in all campaigns where an 80% attendance at each phase is considered to be very good.

Time of Administration

Apart from interference between the poliovirus types, other enteroviruses such as Echo-virus and Coxsackie viruses have been shown to interfere with the establishment of the poliovirus in the alimentary tract. The percentage of 'takes' is then lowered and vaccination less efficient. This occurs mainly during the summer months when enteroviruses are more prevalent. So, ideally, the vaccine should be administered during the colder months of the year. However, mass vaccinations repeated on 2 or 3 occasions have been shown to overcome the effect of interfering enteroviruses completely.

Development of Immunity

Within about 4 days after administering the vaccine, an intestinal 'block' to poliovirus of the same type is established. Exposure to 'wild' virulent, paralytogenic virus at this stage does not result in an infection. Conversely, however, if the wild virus is present when the vaccination is done, it has no effect on the course of the natural disease. After a successful vaccination, measurable antibodies are present after a week and good immunity is established in 2-3 weeks.

Vaccination During an Epidemic

Because of the rapid development of the 'blocking' effect and the formation of neutralizing antibody, the oral vaccine can be used effectively to limit the extent of epidemic poliomyelitis of a known poliovirus strain. As soon as it is judged that paralytogenic virus has been or may be introduced into a community, a mass vaccination of all the population at risk must be carried out with extreme urgency. The wild virus circulates with great rapidity, and delays in introducing the attenuated virus can easily render the vaccination ineffective. In this respect a great deal can be said for anticipating an epidemic.

Stability of the Vaccine

The concentrated vaccine stored in a 'deep freeze' type refrigerator at a temperature of −20°C retains undiminished potency for one year. At the temperature of melting ice, i.e. at +0.5°C the viability of the virus remains unimpaired for 2 weeks. At +4°C (ordinary household refrigerator temperature) the virus remains viable for 1 week. At room temperature loss of potency will depend on temperature conditions, but a limit of hours to 1 day should be observed. In general, concentrated virus and virus preparations, syrup or sweets, should be kept frozen or in contact with ice. Diluted virus solutions should be used within 24 hours and should be kept in contact with ice, or frozen, during that period. This applies particularly to handling the fluids in the field. As the virus is sensitive to ultra violet irradiation, protection of fluids against sunlight is essential.

Results of Oral Vaccination

At the International Poliomyelitis Conference at Copenhagen in July 1960, it was reported that over 80 million individuals had been vaccinated with the Sabin strains of attenuated oral poliomyelitis vaccine. There had been no untoward reactions and good immunity resulted from the vaccinations.

Vaccine manufactured and tested at the Poliomyelitis Research Foundation, Johannesburg, has been used in field trials since August 1959. To date, about 4½ million doses of type 1 and 400,000 doses of trivalent vaccine have been issued.

In assessing the potency of this vaccine, a large number of blood specimens have to be tested in order to obtain a significant number lacking antibodies to one or more of the 3 types of poliovirus. This has presented some difficulty, particularly the taking of follow-up specimens. These studies were done in widely varying population groups, climatic conditions, and hygienic standards. Differences in results must be interpreted accordingly, since the prevalence of other circulating enteroviruses play an important part in the number of 'takes' achieved after 1 feeding. The results are shown in tables I and II.

TABLE I. ORAL VACCINE POTENCY CONTROL (POLIOMYELITIS RESEARCH FOUNDATION)

Study group	Number of vaccinations	Antibodies acquired				Complete immunity acquired
		Type 1	Type 2	Type 3	All 3 types	
Mauritius Trivalent Infant	1	8/30 : 26%	32/42 : 76%	12/22 : 55%	52/94 : 55%	16/43 : 37%
Rodrigues	1		13/20 : 65%	33/44 : 75%	46/64 : 72%	32/46 : 70%
Uganda	1	4/10 : 40%	14/20 : 70%	3/11 : 27%	21/41 : 51%	14/32 : 44%
Boksburg Infants	1	16/29 : 55%	25/28 : 89%	31/38 : 82%	72/95 : 76%	27/47 : 58%
Hope Training Home	1	2/2 : 100%	8/8 : 100%	5/7 : 71%	15/17 : 88%	12/14 : 86%

TABLE II. ORAL VACCINE POTENCY CONTROL (POLIO FOUNDATION CLINIC, POLIOMYELITIS RESEARCH FOUNDATION)

Study group	Number of vaccinations	Antibodies acquired				Complete immunity acquired
		Type 1	Type 2	Type 3	All 3 types	
Polio Foundation Clinic	1	22/42 : 52%	55/57 : 97%	55/61 : 90%	132/160 : 83%	88/117 : 75%
	2	38/42 : 91%	56/57 : 98%	59/61 : 97%	153/160 : 96%	110/117 : 94%
	3	40/42 : 95%	57/57 : 100%	59/61 : 97%	156/160 : 98%	114/117 : 97%

In general it can be said that, under average living conditions, *one* feeding with trivalent vaccine converts to positive 70-80% of the 'negative' antibodies; that this figure is increased to about 90% at the second feed; and that the third feed gives near to 100% protection—as good an immunity as is ever achieved by any artificial immunization. This immunity and the intestinal resistance induced by the vaccination, holds the great promise of virtual eradication of poliomyelitis by mass vaccination campaigns.

Safety

It has not yet been proved that one single case of paralytic poliomyelitis has been caused by the administration of Sabin strains in vaccinees or their contacts, and the number of vaccinations now probably exceed 90 million. It means that the theoretical consideration of increased virulence to contacts on human passages has proved to be of very little importance as regards the safety of the vaccine.

Other extraneous pathogenic viruses and bacteria derived from monkey tissues can be eliminated by adequate laboratory procedures.

Of the non-pathogenic viruses, the so-called Simian agents, which are naturally present in some normal monkey tissues, can be excluded by control procedures which bar from use tissues that show evidence of their presence and by an additional appropriate chemical treatment of the virus fluids. This is done on principle, because the significance of these agents is not known and, since they have been actually administered to many millions without ill effect, they do not jeopardize the safety of the vaccine. Similar agents are present in all domestic animals, and persons handling these animals or their carcases are continuously exposed to these viruses with no apparent ill effects. Where evidence is available, it points to the fact that these 'concomitant' viruses developing in tissue cultures, do not cause infections in human beings by ingestion.

Reactions

The vaccine contains minute quantities of antibiotics that have been used in the production phase of the virus fluid several months before use. Dilute solutions of these antibiotics lose antibiotic activity within a few weeks and, since no preservative is added to the fluid, very likely lose their antigenic properties. At the time of issue, there can be present at the most 2 units of penicillin and 1 microgramme of streptomycin and of neomycin per dose. The vaccine has been given with no reactions whatsoever to individuals who reported severe allergic reactions to the Salk type vaccine.

Coincidental illnesses often occur after administration of oral vaccine and are almost invariably associated with it. After administration of several million doses of South African vaccine, there has not emerged a pattern of reaction occurring at a specific period after ingestion of the vaccine virus, and it is impossible to advise medical practitioners on what type of reaction to expect and how to deal with it. If the vaccination gives rise to some clinical condition, it must be extremely varied, both as to its nature and the time of occurrence. Serious illnesses attributable to the vaccine have yet to be demonstrated and any symptoms or signs occurring after vaccination should only be attributed to the vaccine after all other possible causes have been eliminated. The question of reactions can only be settled if a large scale controlled experiment is conducted with the alternative feeding of placebo and vaccine. Because of the observed innocuousness of the vaccine, this type of experiment, which is difficult to apply, has not been considered justifiable or necessary.

Age Groups

Serological surveys in South Africa have shown that the Bantu at the age of 10 has the same immune status, i.e. almost complete protection to all 3 poliovirus types, as the European of 30 years of age. About 80% of paralytic poliomyelitis occurs in the European children 6 years and under and in the Bantu of 5 years and under.

The oral vaccine has been shown to infect newborns shortly after birth with the production of antibodies. This takes place in spite of the presence of maternal antibodies. However, the immune mechanism is not fully developed at birth, and after 2 weeks a resistance to infection with the attenuated virus sets in and this lasts up to about the third month. Antibodies developed after this age are of lasting nature.

Contra-indications

As the vaccine has little, if any, reaction there is probably no true contra-indication to its administration. However, on principle it is recommended that persons who are confined to bed with a febrile illness, and cases of diarrhoea, should be excluded from vaccination until they have recovered.

Tonsillectomy and Elective Surgery

There is no evidence that the trauma of tonsillectomy or dental extractions and other surgery have any influence on the safety or efficacy of oral vaccination. On principle again, it is recommended that, where possible, an interval of *2 weeks* or more before and *1 week* or more after such surgery should be allowed.

Relationship to Other Immunization

Oral poliomyelitis vaccine has been safely and effectively given simultaneously with diphtheria, whooping cough, and tetanus immunization. However, in order not to discredit the oral vaccine because of reactions produced by triple vaccine or smallpox vaccine, it is recommended that a 14-days interval be observed.

Restrictions

It is recommended that no carbonated, alcoholic or other flavoured drinks be taken for 2 hours after vaccination. This also applies to medicines. No restrictions as regards exercise or other activity of the vaccinee need be applied, apart from severe exercise for about 2 hours after vaccination.

Salk Vaccination

Until such time as a complete course of oral vaccination has been given, Salk type vaccination should continue as before. Thereafter oral vaccine should be considered to be the vaccine of choice for rapid and safe immunization at all ages from 3 months upwards.

Effectiveness

After a course of vaccination of 3 trivalent doses, the only sure method of gauging the immune status of the individual is by submitting serum for a serological test at the Polio Research Foundation. This would indicate the need, if any, for further immunization. For the test 5 ml. of clotted blood is required.

Mass Vaccination Campaigns

Three factors mainly influence the efficacy of the oral vaccine: loss of potency due to incorrect handling, the type interference, and interference by other enteroviruses. The first can be overcome by always keeping the vaccine in or near to the frozen state. The second factor is overcome by repeated ingestion at suitable intervals of all 3 types of poliovirus.

It has been shown that the effect of interfering enteroviruses can be eliminated by doing mass vaccination on repeated occasions and thus 'flooding out' the other viruses. In addition the 'to and fro' effect, whereby vaccinees, who fail to take on one occasion, become re-exposed by contact with an excretor of that particular virus type, is much enhanced by increasing the number of cases fed in a given area at the same time. Oral vaccination, therefore, is more likely to achieve its goal of poliomyelitis eradication by nation-wide mass campaigns.

Follow-up Vaccination

Once the community has been satisfactorily immunized, the circulation of natural wild poliovirus strains, that gives rise to relative protection by means of the oral vaccination that Nature has supplied up to now, is no longer possible. A high degree of susceptibility to poliomyelitis and conditions suitable for severe epidemics could thus develop if oral vaccination is not continued so as to constantly immunize all susceptibles, e.g., newborn infants and immigrants. To overcome this hazard of mass artificial immunization, it may be desirable to make vaccination with oral vaccine compulsory within the first few months of life.

Duration of Immunity

The indications at present are that the immunity induced by the live avirulent poliovirus lasts for many years and may be lifelong, as is the case with a natural infection. Individuals vaccinated 10 years ago still have demonstrable antibody in the blood and the reduction in titre is of a low order.

ORAL POLIOMYELITIS VACCINE : SLUKENTSTOF VIR POLIOMIËLITIS

APPEAL BY THE CHAIRMAN OF FEDERAL COUNCIL

The Union Department of Education has decided to launch a countrywide campaign during the coming winter, for the mass administration of oral poliomyelitis vaccine. It is intended to immunize, as far as possible, all groups of the community which are at risk — Africans, Asians, Coloured people, and Europeans. If this effort proves successful, South Africa will be the first country outside Russia to undertake a campaign of this nature on such a vast scale.

In order to succeed the Department is dependent on the assistance of a large number of voluntary workers: in particular it is dependent on the assistance and cooperation of all the doctors. Without their help the campaign cannot succeed.

It will be greatly appreciated if everybody would cooperate on the basis of a voluntary service and not on the basis of a paid professional service. This is the only way in which the immunization of every person at risk can be attempted. Subsequently doctors will be personally and professionally responsible for the immunization of their own patients in the normal course of events.

Details concerning technical and scientific aspects of the problem of mass-immunization for poliomyelitis are published elsewhere in this issue of the *Journal* with a view to informing doctors fully of the details and implications of the campaign.

On behalf of the Federal Council I should like to appeal urgently to all the members of our profession to cooperate fully in order to make this important campaign a success. Let us willingly and gladly avail ourselves of this unique opportunity to render a truly national service to the peoples of this country.

E. W. Turton
Chairman, Federal Council

P.O. Box 5069
Boksburg North

OPROEP DEUR DIE VOORSITTER VAN DIE FEDERALE RAAD

Die Departement van Unie-gesondheid het besluit om gedurende die komende winter 'n landswye immunisasieveldtog teen poliomiëlitis op 'n ware nasionale grondslag te onderneem. Die bedoeling is om so 'n hoë persentasie as moontlik van almal wat vatbaar is, te immuniseer — insluitende Naturelle, Asiate, Kleurlinge, en Blankes. Indien hierdie poging slaag, sal Suid-Afrika die eerste land wees, behalwe Rusland, wat so 'n kampanje op so 'n groot skaal onderneem.

Om sy doel te bereik, is die Departement aangewese op 'n groot aantal vrywillige helpers uit die geledere van die publiek, maar eintlik en veral ook op die heelhartige ondersteuning van al die lede van die mediese professie. Sonder hulle hulp kan die poging nie slaag nie.

Die bedoeling is dat almal moet meewerk op 'n gemeenskapsgrondslag (en nie op 'n betaalde professionele grondslag nie) met die oogmerk om eers die basiese immunisering van almal wat vatbaar is, te bewerkstellig. Daarna sal geneeshere dan die immunisering van hul eie pasiënte in die gewone loop van sake kan onderneem.

Besonderhede oor die tegniese en wetenskaplike aspekte van die probleem, word elders in hierdie uitgawe van die *Tydskrif* gepubliseer, met die doel om alle geneeshere sover as moontlik ten volle op die hoogte van sake te bring aangaande die besonderhede en implikasies van die kampanje.

Namens die Federale Raad van die Mediese Vereniging wil ek graag langs hierdie weg 'n dringende beroep op alle lede van ons professie doen om hul heelhartige ondersteuning aan hierdie groot en belangrike onderneming te verleen. Laat ons die geleentheid om 'n ware landsdiens te verrig met gewillige harte en hande aangryp.

E. W. Turton
Voorsitter, Federale Raad

Posbus 5069
Boksburg-Noord

WORLD LIST OF FUTURE INTERNATIONAL MEETINGS

ALTERATIONS AND ADDITIONS NOTIFIED DURING FEBRUARY 1961

International Union for Child Welfare, Geneva, Spring 1961. 1 rue de Varembé, Geneva, Switzerland.

Congress of Laboratory Medicine, Berlin, 27 - 30 April 1961. Dr. W. Massman, Rubenstrasse 125, Berlin-Friedenau, Germany.

European Academy of Allergy, Meeting, Berlin, 28 - 29 April 1961. Dr. Quarles van Ufford, General Secretary, Emmalaan 17, Utrecht, Netherlands.

International Symposium on Comparative Endocrinology, 3rd meeting, Tokyo, 5 - 10 June 1961. Dr. K. Takewaki, Chairman, Department of Zoology, University of Tokyo, Tokyo, Japan.

All-European Institute of Scientific Studies for the Prevention of Alcoholism, 7th meeting, Amsterdam, 12 - 23 June 1961. A. Tongue, Case Gare 49, Lausanne, Switzerland.

Mediterranean Medical Union, Paediatric Meeting, Alicante, Spain, 25 - 28 June 1961. Dr. F. C. Beret, Secretary General, Avenue Generalisimo Franco 360, Barcelona, Spain.

International Symposium on the Morphological Precursors of Cancer, Perugia, Italy, 25 - 29 June 1961. Prof. Lucio Severi, P.O. Box 167, Perugia, Italy.

THE DESIGN AND PURPOSE OF THE SCIENTIFIC EXHIBIT

H. O. HOFMEYR, CHAIRMAN, SCIENTIFIC EXHIBITION SUB-COMMITTEE, 43rd MEDICAL CONGRESS, CAPE TOWN, 24 - 30 SEPTEMBER 1961

Not only are scientific exhibits very effective as a form of medical-professional relationships, but they are accepted without question as being ethical. They help the authors to build consultant practices by creating respect for their competence in original research (the research exhibit) or the correlation of all known facts about a subject (the teaching exhibit). Restrained but effective medical illustration in good taste greatly enhances the improved professional relationships that develop in its atmosphere.

Primarily, the scientific exhibit is designed to report new advances in the doctor's special field, and it also identifies the exhibitor as a man of competence and judgment who can give advice on the spot on problem cases. He remains available to the visitor long after the latter has returned home. No psychological pressure is exerted on the visiting physician because of the attractive impersonality of the exhibit. The specialist exhibitor attends his booth to discuss problem cases informally with the visiting physician who gains a unique opportunity to sum him up as a colleague or friend. The lowliest doctor can consult a leading authority and have his questions answered with unforgettable illustrations from the exhibit. Within its limitations of time and space, the scientific exhibit is probably the best device invented to communicate ideas about medicine.

After the last medical congress in Cape Town (1949) I often heard these remarks as visitors left the exhibits: 'worth more than a hundred papers' and 'the most instructive feature of the meeting'. Because of this enthusiasm, many of us have worked, through the years, to make the scientific exhibits a permanent feature of our congresses. In 1949 exhibits on a large scale were recognized as an integral part of congress for the first time in our history.

Dr. Harold Hofmeyr, presently Chairman of the Scientific Exhibition Sub-committee, has had considerable experience in organizing scientific exhibits. He was Chairman of a similar sub-committee in 1949, when, for the first time, the scientific exhibition organized on an extensive scale became an integral part of the South African Medical Congress. Dr. Hofmeyr, in working with the American Medical Association, has also had wide experience in organizing exhibitions of this nature. Would-be exhibitors are invited to write to Dr. H. O. Hofmeyr, Congress Office, 43rd South African Medical Congress, P.O. Box 643, Cape Town.

Planning the Scientific Exhibit

The question of giving some guidance, especially to our younger members who might be exhibiting for the first time this year, was discussed with the Editor of the *Journal*. His support induced us to attempt to recall as many of the good points as possible garnered on visits to scientific exhibits, both temporary and permanent, at scientific meetings and hospitals in Europe and the USA. We shall confine our remarks to research and teaching exhibits. Promotional exhibits whether for a product, person, or institution have no place on a scientific programme. Their place is in the commercial exhibits.

Reaction of Visitors

It is important to remember that your audience is not 'captive' as in a lecture hall; it is free to roam at will and choose what is most interesting. As the visitor's feet get tired and his brain confused, he becomes 'allergic' to the poorly designed or cluttered exhibits and those without demonstrators. He stops at the well-arranged, the orderly exhibit, and the exhibit with a keen demonstrator ready to discuss his personal problems.

Backwall versus Sidewall

Sidewalls double the capacity of an ordinary booth. Our eyes give preference to the backwall as the most important area. The modern tendency is to scrap the booth for a prefabricated exhibit on a straight line. This, for example, increases the old 12-foot booth to 20 feet and multiplies our space problems. The visitor may also have difficulty in finding the centre of importance.

Height

By all means let us avoid the 'stretch, stoop and squint' exhibit where fine print is carried down to the floor and up to the eight-foot level. The most comfortable visual band for the ordinary observer is between the height of an ordinary table — 2½ feet — and an upper limit not exceeding 7½ feet. The upper 6 - 12 inches could be used for names, sub-headings, etc.

Planning

A well worked out plan will save time and money. Make a 'mock up' of your exhibit in the form of a small model so that you will readily see deficiencies. It is important to remember that you are being shown in competition with many others. Too great an effort on the part of the observer or a too involved-looking exhibit will cause you to be bypassed.

Graphs

A valuable adjunct to the exhibit is the simple chart that is easily understandable. It can so easily tell an untruth or a half truth that scrupulous care should be exercised in preparing it. Don't muddle or confuse the observer. A graph should be a picture of statistical material in easily remembered form.

Photographs

Don't overdo them, as is so often done, or your exhibit will become dull or boring. Use the minimum number of words to identify photographs and indicate clearly what they are intended to show. Use colour when the point you are trying to make will be enhanced.

Colour

Colour is an essential ingredient of any exhibit, especially when it is used to emphasize important details which must be clearly understood. It must be used judiciously. It is a 'must' in a modern exhibit, but care must be exercised to avoid the effect of the Coons on parade.

Transparencies

This method is effective and is easier on the observer than other methods of presentation. A combination in black and white and colour can be used with pleasing effect, but balance is important. It is essential to have a strong light behind them with no glare leak. In front the light should be lessened.

Captions, Signs and Labels

Long and vague titles will not capture the interest of the passing observer. The main title should be short, arresting and descriptive and, if not completely adequate, may have sub-titles in smaller lettering. They help the orderly arrangement. Legends and labels on illustrations, drawings, and photographs should be long enough for the proper information, but brief enough to be easily read. Letters should be of the correct size to enhance legibility.

The Medical Illustrator

So important has this individual become in the USA that many medical schools have either a professor or director of medical illustration. They have their own association of medical illustrators and publish a journal. Their directory and bibliography on medical illustration is available from Miss Rose Reynolds, Secretary, Association of Medical

Illustrators, University of Nebraska College of Medicine, 42 Dewey Ave., Omaha 5, Nebraska. Dr. Arthur Bulbulian of the Mayo Clinic is the recognized authority on teaching models.

The medical illustrator has, through specialized training and experience, become qualified to serve as consultant, designer and coordinator as well as illustrator. In every medical school in South Africa there are individuals who show special aptitudes for medical illustration. The scientific exhibits at congress provide the opportunity to display their proficiency to the entire medical profession to the lasting benefit of everyone.

Cost

Polished wood and fancy fittings are no more essential to medical instruction than marble halls in a medical school are essential to medical education. Good exhibits, even with strict economy, require some money. It would be a serious loss to medical teaching if our exhibits went no further than congress. With so many groups within the M.A.S.A. having annual meetings, the exhibit budget should take cognizance of the fact that at least two or three medical meetings will be served. Lastly some exhibits will go back to medical schools to extend their permanent ones. This applies in particular to good teaching exhibits.

Exhibits are usually paid for out of departmental grants. However, some administrations are now setting up an exhibit fund for those departments that have no grant but have research material worthy of exhibition. Such departments can draw on the fund to a limited extent provided 3 - 6 months notice is given.

The Good Exhibit

An American authority, Dr. Alan Gregg, has aptly defined the hallmarks of a good exhibit as follows: 'It translates or formulates the less familiar into terms that are more familiar; it translates the obscure into the clear, the variant into the constant, the complex into the simple, the vague into the precise, forms into functions, and states into forces'.

ACKNOWLEDGEMENTS

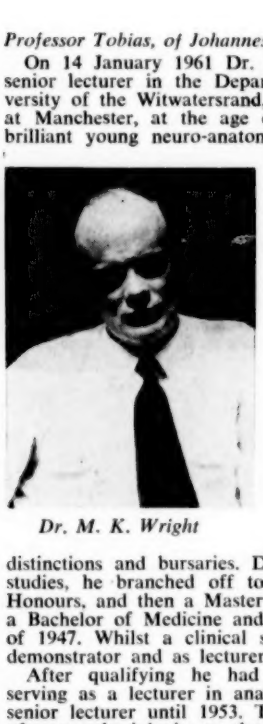
1. Journal of the Association of Medical Illustrators (No. 2, 1959).
2. Exposition as applied to Medicine. Univ. of Michigan Medical Bulletin, May 1955 (**21**, 140).
3. Charts, lantern slides and comments. A.M.A. Archives of Dermatology, March 1958 (**77**, 299).

IN MEMORIAM

MICHAEL KENT WRIGHT, M.B., B.Ch., M.Sc. (RAND.)

Professor Tobias, of Johannesburg, writes:

On 14 January 1961 Dr. Michael Kent Wright, a former senior lecturer in the Department of Anatomy at the University of the Witwatersrand, died of a coronary thrombosis, at Manchester, at the age of 37½ years. He is the second brilliant young neuro-anatomist from South Africa to have died prematurely in the United Kingdom in recent times, the other having been the late Dr. Harold Daitz, also of the Witwatersrand Department of Anatomy.



Dr. M. K. Wright

Dr. Wright was born of British parents in East Africa in 1923. After a period in the United Kingdom, he came to South Africa at the age of 7 years and attended school here, matriculating from Hilton College, Natal, after an excellent school career. He entered the Witwatersrand Medical School in 1940, having been refused enlistment in the armed forces on account of a bilateral foot-drop.

His academic career was punctuated by a number of distinctions and bursaries. During the course of his medical studies, he branched off to take a Medical B.Sc., a B.Sc. Honours, and then a Master of Science degree, graduating as a Bachelor of Medicine and Bachelor of Surgery at the end of 1947. Whilst a clinical student he served as a graduate demonstrator and as lecturer in the Department of Anatomy.

After qualifying he had a wide variety of experience, serving as a lecturer in anatomy from 1948 to 1950 and as senior lecturer until 1953. Thereafter, he filled the positions of neuro-physiologist to the Department of Applied Electrophysiology at the National Hospital for Nervous Diseases, Queen Square, London (1953-54); registrar at Queen Square (1954); medical officer to the Neuro-Surgery and Neurology Departments of the Johannesburg General Hospital, as well as assistant neurologist at Tara Hospital, Johannesburg. At the beginning of 1959, he resumed his position as senior lecturer in anatomy at the University of the Witwatersrand, a position which he held until, in August 1960, he was appointed to a lectureship in experimental neurology at the University of Manchester.

His special field of interest was the nervous system, and I have no hesitation in saying that his background in the several fields of neurology was second to none. His training combined a considerable body of experience in both comparative neuro-anatomy and experimental neuro-anatomy, and neuro-physiology. His M.Sc. thesis reflected his earlier interest in the comparative approach to the study of the nervous system: it was on the cell-masses in the forebrain of the elephant shrew. Subsequently, he delved very deeply into the electro-physiological approach to neurology and made a number of significant contributions. Thus, he had a wide and all-round background in the field of neurology, and it is no exaggeration to say that few people were as well equipped as Dr. Wright to engage in research in the subject.

He had about 25 published works to his credit, ranging in subject matter from the pre-optic region of the mammalian brain to the electro-encephalographic correlates of consciousness. His text-book, *Fibre Systems of the Brain and Spinal Cord*, was first published in 1952 by the Witwatersrand University Press; it has since run to a second edition (1959) and is used by medical students, candidates for the Diploma in Psychological Medicine and others, not only in South African Medical Schools, but also abroad, in the United Kingdom and the United States. The manner of presentation of the book illustrates Dr. Wright's lucid expression which made him an outstanding and engaging teacher.

He had a rare ability to attract students to his subject and, over the years, trained a number of research men in his field. Several of these, as with Dr. Wright himself, were offered appointments by Prof. Sir Wilfred le Gros Clark in the Department of Human Anatomy at Oxford; one of them, Dr. Maxwell Cowan, is still a lecturer in this department. After an absence of some years Dr. Wright returned to the Anatomy Department in Johannesburg in 1959 and almost immediately acquired a class of honours students specializing in his branch of anatomy.

His death has shocked his many friends and colleagues. Even in his last two years in the Anatomy Department he showed himself to be a calm and efficient organizer and a very hard worker, often staying at Medical School till well into the night, when he had an unfinished task on hand. He was a determined individual of noteworthy ability and competence. He felt deeply on his subject and never tired of stressing the need for a more rigorous approach in modern electro-encephalography. Sensitive of nature, he was quick to express himself when he felt that his views or his subject were being called into question. He never failed to fascinate and to stimulate those who heard him speak.

Mike Wright's passing leaves a definite gap in the field of neurology in South Africa and abroad.

All his friends will wish to extend their deepest sympathy to his family in South Africa and to his wife and children at their family home in North Wales.

PASSING EVENTS : IN DIE VERBYGAAN

Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns. Die Tak Simon van der Stel van die Suid-Afrikaanse Akademie vir Wetenskap en Kuns het op Dinsdagaand 7 Maart 'n gesamentlike vergadering gehou met die plaaslike Ingenieursafdeling van die Akademie. Die onderwerp wat bespreek is, is die gebruik van radioisotope in die medisyne, die ingenieurswese, en die landbou.

As sprekers het opgetree dr. P. D. R. van Heerden van die Departement Interne Geneeskunde van die Karl Bremerhospitaal; mnr. L. le Roux, mediese fisikus aan die Groote Schuur-hospitaal; mnr. M. C. B. Smit, lektor in die fisika aan die Universiteit van Stellenbosch; en dr. D. G. Marais, fisikus, verbonde aan die Landbou Departement van die Universiteit van Stellenbosch.

Die vier sprekers het elkeen 'n afsonderlike aspek van die probleem toegelig, insluitende die terapeutiese, tegniese, administratiewe, wetenskaplike, en toegepaste gebruike van radioisotope. 'n Lewendige bespreking het gevolg en 'n groot aantal interessante vrae is gestel.

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Dr. A. V. Hayes has recently returned to the Union after doing postgraduate work in various centres in London and Germany, and has now commenced practice as an ear, nose and throat surgeon at Medical Centre, East London. Telephones: Rooms 3676, residence 81720.

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Dr. A. V. Hayes het onlangs teruggekeer na die Unie nadat hy nagraadse werk gedoen het aan verskeie sentrums in London en Duitsland. Dr. Hayes het nou begin praktiseer as 'n oor-, neus- en keelarts te Mediese Sentrum, Oos-Londen. Telefone: Spreekkamer 3676, woning 81720.

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Nutrition Society. A meeting of the British Nutrition Society will be held at Oxford, England, on Saturday 15 July '61. The meeting will take the form of a Symposium on 'Nutrition and metabolic defects'. The Chairman of the meeting will be Sir Hans Krebs. Those practitioners who may be in Britain during July and are interested in attending this meeting may obtain further information from Dr. B. Bronte-Stewart, c/o Department of Medicine, Medical School, University of Cape Town, Observatory, Cape.

Ophthalmological Society of the United Kingdom, Treacher Collins Prize Essay. The Council of the Ophthalmological Society of the United Kingdom will award a prize of £100 for the best essay submitted on the subject 'Demyelinization and the eye'. The prize is open to qualified medical practitioners of any nationality, and the essay is to be written in English. Essays should be submitted to the Hon. Secretary, Ophthalmological Society of the United Kingdom, 47, Lincoln's Inn Fields, London, W.C.2, from whom further particulars may be obtained. The closing date for sending in essays for this award is 31 December 1962.

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International Psychosomatic Cancer Study Group. The 2nd International Conference of this Group will be held in Paris from 27 to 29 August 1961. The theme of the conference will be 'Psychosomatic aspects of neoplastic disease'. Further particulars may be obtained from the U.K. representative, Dr. D. M. Kissen, Brookfield, Elm Walk, Bearsden, Glasgow, Scotland.

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Hamilton-Maynard Memorial Medal for 1960. The Head Office and Journal Committee of the Medical Association have unanimously agreed that the Hamilton-Maynard Memorial Medal for 1960 be awarded to Prof. C. Lewer Allen, in recognition of his paper entitled 'The University of Cape Town artificial limb' which was published in the *Journal* of 13 February 1960.

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University of Natal Medical Students' Council. The second Clinical Conference of the Medical Students' Council will be held at 8.15 p.m. on 25, 26 and 27 April 1961 in the Upper Lecture Theatre, Medical School, Umbilo Road, Durban. The theme of the Conference will be 'Some parasitic diseases in man'. Further information may be obtained from the Secretary, Medical Students' Council, Medical School, Umbilo Road, Durban.

* * *

Mr. Walter L. Phillips, thoracic surgeon, has changed his address to 'Zandwyk', Beach Road, Muizenberg, Telephone 81417.

NEW PREPARATIONS AND APPLIANCES : NUWE PREPARATE EN TOESTELLE

ENDURON

Abott Laboratories announce the introduction of a new and valuable one-a-day diuretic, Enduron, and supply the following information:

Enduron (methyclothiazide, Abbott) is claimed to be the logical culmination to thiazide therapy. The predominant effects of Enduron are diuresis, natruresis, and chloruresis. Serum-potassium levels are little affected. Although the excretion of sodium is greatly enhanced, the excretion of potassium is not increased proportionally. Consequently, potassium depletion infrequently presents a problem in patients treated with Enduron.

Clinically Enduron offers several important advantages when compared with the older benzothiadiazines.

1. Enduron leads to greater sodium excretion per unit of potassium excreted and to less total potassium loss than other benzothiadiazines.

2. Enduron has a duration of effect of at least 24 hours — longer than other benzothiadiazines, affording satisfactory therapy with one dose daily.

3. Enduron is highly potent; 10 mg. produces as great a natruresis as the peak effect of any available benzothiadiazine.

For the maintenance of an oedema-free state or as an adjunct in the management of hypertension, 2·5 - 5 mg. of Enduron once daily will usually be sufficient.

Enduron is packed as 5 mg. grooved tablets in bottles of 25.

BOOK REVIEWS : BOEKBESPREKINGS

HEALTH SERVICE

Health Service, Society, and Medicine. By Karl Evang. M.D. Pp. viii+167. 21s. 0d. South Africa agents: Oxford University Press, P.O. Box 1141, Cape Town, London: Oxford University Press. 1960.

This small volume, comprising the University of London Heath Clark Lectures for 1958, which were delivered at the London School for Hygiene and Tropical Medicine, covers the main types of existing health services, the rôle of the hospital, the place of the general practitioner, the evolvement of new drugs, and the public-health services as they apply to the more advanced and enlightened countries, but with special reference to those adhering to the Western democratic system.

The author, who holds the important post of Director General of Health Services for Norway, covers, in the course of these lectures, his subject matter in its widest aspect.

As a medical administrator he can speak with great authority and some feeling on the outlook of the politicians, and their professional financial advisers when requested to provide monies for the various types of health services. An attempt to force the health administrator to justify the expenditure of such money in terms of the health is all too common a demand by such controlling bodies and is something which,

in my opinion, should be resisted with all one's power.

It is completely impossible to do justice to these lectures in a review of this sort, since they should be read in their entirety, not only by the public-health and medical administrator, but also by the medical specialist, as well as the general practitioner, if the messages which they contain are to be appreciated by those most concerned.

The author very succintly covers the possible integration of the curative and preventative services at hospital level and draws attention to the many symposiums — including the World Health Assembly meeting of 1957 — where the pros and cons were fully debated in an attempt to place this important principle in its correct perspective.

The place of the general practitioner in the health organization of most countries is also fully dealt with, together with his attitudes to his patient and the health organization of his country. The fact that the general practitioner tends to work in solitary isolation at a time when the main emphasis is on teamwork and correlation of effect, receives much emphasis by the author. The old adage of the doctor/patient relationship is debunked and it is suggested that a 'superior' type of physician should be trained to deal with the multiplicity and extensive ramifications in which medicine finds itself at the present time.

These views will certainly not meet with the approval or the support of the majority of general practitioners today.

Many of the author's opinions are topical and urgent, and have been given serious thought and consideration following the many years afforded to him in discussing health organization with responsible persons in those many other countries which he has been able to visit. As he says, many of his views are not original, but they do at least reflect the author's present ideas, impressions, and the suggested means of implementation.

I have no hesitation in recommending to all my medical colleagues that this publication should be read, mainly with a view to stimulating critical appraisal of the suggestions offered and thereafter possibly applying those aspects which might suit the peculiar socio-economic pattern of the health services as they apply this country. E.D.C.

CORRESPONDENCE : BRIEWERUBRIEK

THE MEDICAL SERVICES PLAN

To the Editor: Dr. Theron in his letter of 4 March[1] says that he is afraid that the real object of the Natal Coastal Branch, in calling the recent Extraordinary Meeting at Bloemfontein, was to involve the Association in the taking over of the Medical Services Plan, and he exhorts his colleagues to be 'wary'.

It is beyond our comprehension that he can read such an object into the suggestion of our Branch which asks simply that we should meet 'with a view to implementing the Medical Services Plan in all of the Provinces of South Africa'. This suggestion, and this suggestion alone was before the Meeting, and it was to this we spoke. As for the necessity or otherwise of the meeting, time will tell; but we hoped that it would provide an opportunity for the 6,000 odd doctors, engaged in active practice, to express their personal views — an opportunity they ordinarily do not get.

The Medical Aid system as at present constituted contains a vital flaw. The whole administration is in the hands of laymen. We believe that any medical scheme must, if it is to be acceptable, have reasonable professional representation at all levels, i.e. of doctors engaged in private practice. Throughout the world where this principle has been ignored, trouble has followed.

With our recent experience of the South African Mutual Medical Aid Society as a warning, we were apprehensive of what might happen if the lay administration of the societies become overwhelmingly powerful.

We are satisfied that the medical control of the Plan meets this difficulty and also has the great advantage that, in the matter of disputes or discipline, the doctor will be judged solely by his peers. For example, we regard it as fundamental that all accounts should be scrutinized by doctors and not by lay clerks.

No other such scheme of pre-payment insurance exists in the country today, and thus the Plan has our support. We believe that the Association cannot hold the Plan up as an example of the medical aid society that we prefer to see established, as long as it tacitly expresses its doubts by limiting it to the Transvaal.

Dr. Theron lays stress on the risks involved. We have not denied or minimized such risks. Where we are afraid that many, if not all our opponents, went wrong, was in ignoring the first words of our Branch's request. We asked for the Meeting with a '*view to implementing*' not to '*implement*'! — a vastly different thing — and it was our intention that this should be done through correct and normal channels.

We are well aware that there is a schism in Federal Council over this matter, but it is our firm opinion, and what happened at Bloemfontein has not altered it one jot, that personal feelings and animosities must not be allowed to influence the final decision in a matter which is so vital to all of us who practise in the Union.

Dr. Theron speaks of 'our own (*sic*) long encouraged and fostered medical aid societies'! If a little more of this 'fostering' and 'encouragement' could be spared for the Plan, it might stand a reasonable chance of prospering in spite of his forebodings.

To suggest that those who supported our request did so out of 'ignorance of the history and development of medical aid insurance generally and the Plan in particular' is ludicrous. Is it possible that any practising doctor still exists who has not heard of The Panel and State Medical Service in Britain; the Blue Cross and Green Cross Services of North America, and the schemes of New Zealand and Scandinavia?

It is a common fault of those in Office to underestimate the intelligence of the electorate, and it is a prime cause of the inevitable fall, with the passage of time, of democratic administrations. Woe betide the members of Federal Council in 1963 if they share Dr. Theron's view! As for the Plan, the clear and lucid explanation by Mr. Parvus left no one in doubt as to what it means and involves.

We wish to assert and we are confident that the verbatim account of the Bloemfontein meeting will confirm that no attack was made on the policy of Federal Council, or on the medical aid principle. What we did attack was the complacent attitude of those who believe that we can neglect our defences because those who represent the approved medical aid societies can be implicitly trusted never to do anything that might cause harm to the profession as a whole. Such an attitude ignores the whole history of the development of the Welfare State and its social services.

We note Dr. Theron's account of the inadequacies of the Canadian scheme. We realize only too well that the Medical Services Plan may prove inadequate, but surely, with goodwill, it can be adapted to our needs. At no time did we advocate the Plan, the whole Plan, and nothing but the Plan! We want no monopoly, and would welcome any society or association which incorporates the mutual control we advocate.

At the same time, while expressing gratitude to the early planners mentioned by Dr. Theron, we take leave to doubt whether they — or Dr. Shapiro for that matter — have found the final solution to the problem of pre-paid medical care — a solution that has eluded such giants as Herbert Asquith, David Lloyd George, Charles Hill, Aneurin Bevan, Lord Moran *et al*!

N. R. Pooler
A. G. Sweetapple
H. Grant-Whyte

Durban
12 March 1961

1. Correspondence (1961): S. Afr. Med. J., **35**, 188.